Industrial Arts and Vocational Education

OCTO[illegible] Vol. 42, No. 8

SHOP PROJECTS NUMBER

Marvelous are the things done . . .

Emerging from dubious antecedents, hypnotism is beginning to be recognized for what it can genuinely do . . . and for what it genuinely is. Hypnotism is merely suggestion according to most psychologists, and the marvelous feats performed during the "spell" simply dramatize the great power possessed by suggestion. But these exploits do not begin to tell of the extent to which suggestion is present in everyday life, or the extent to which men respond and are shaped by it.

In hypnotism, the subject agrees in advance to accept the preliminary suggestions of the hypnotist — and in so doing permits the operator later on to establish and control the content of the subject's mind.

The same thing happens when a person goes to a movie: he agrees in advance to accept what the movie announces, and as the picture unfolds, it establishes and controls the content of the person's mind.

And, in fact, when a boy comes to school he too is agreeing in advance to accept the educator's approach. Not that the educator strives to establish and control the content of the lad's mind but by subtle suggestion and impression he seeks to lead the youngster to the point where the *boy* establishes and controls the content of *his* mind. And when this is done right, there need be no further worry about the future outcome.

But just as hypnotist and movie maker are consistent so that no seeming contradiction breaks the *rapport,* so by consistent respect for his subject, for its outcome, for the students in his care, for the work they do, the educator must reinforce the hold he has on the youngster's enthusiasm, zeal, imagination and belief.

No instructor in mechanical drafting will risk vitiating all he has taught and all he will teach, by saying it does not matter whether the student work with cheap and childish drafting instruments. Rather, he insists upon full, honorable quality, full craftsmanship, worthy of the ends of the work and the great careers to which it can lead. This is the climax and *denouement* of *that story*. Nothing must prevent its being told to the end.

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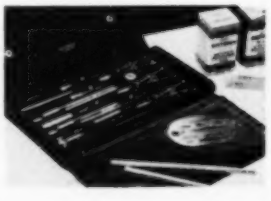

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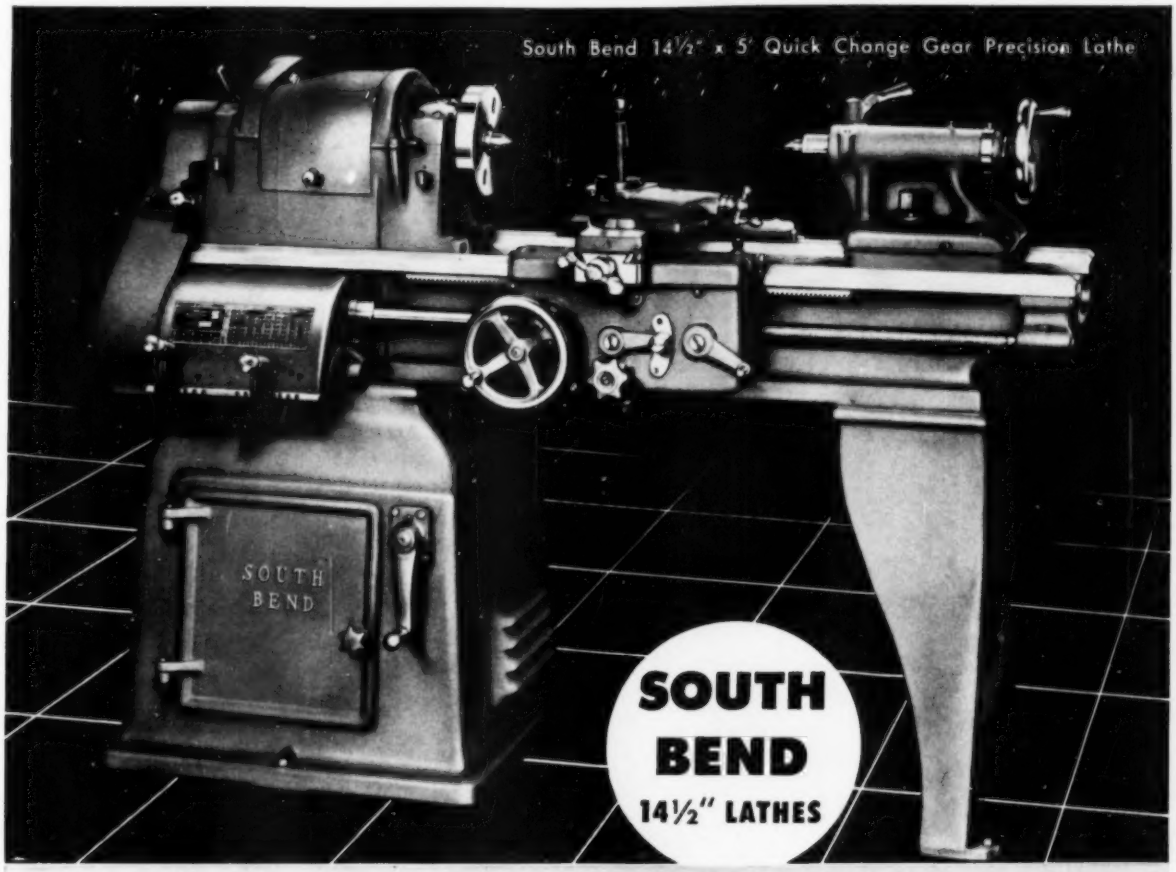

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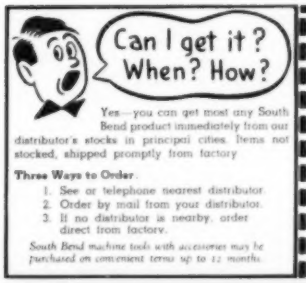

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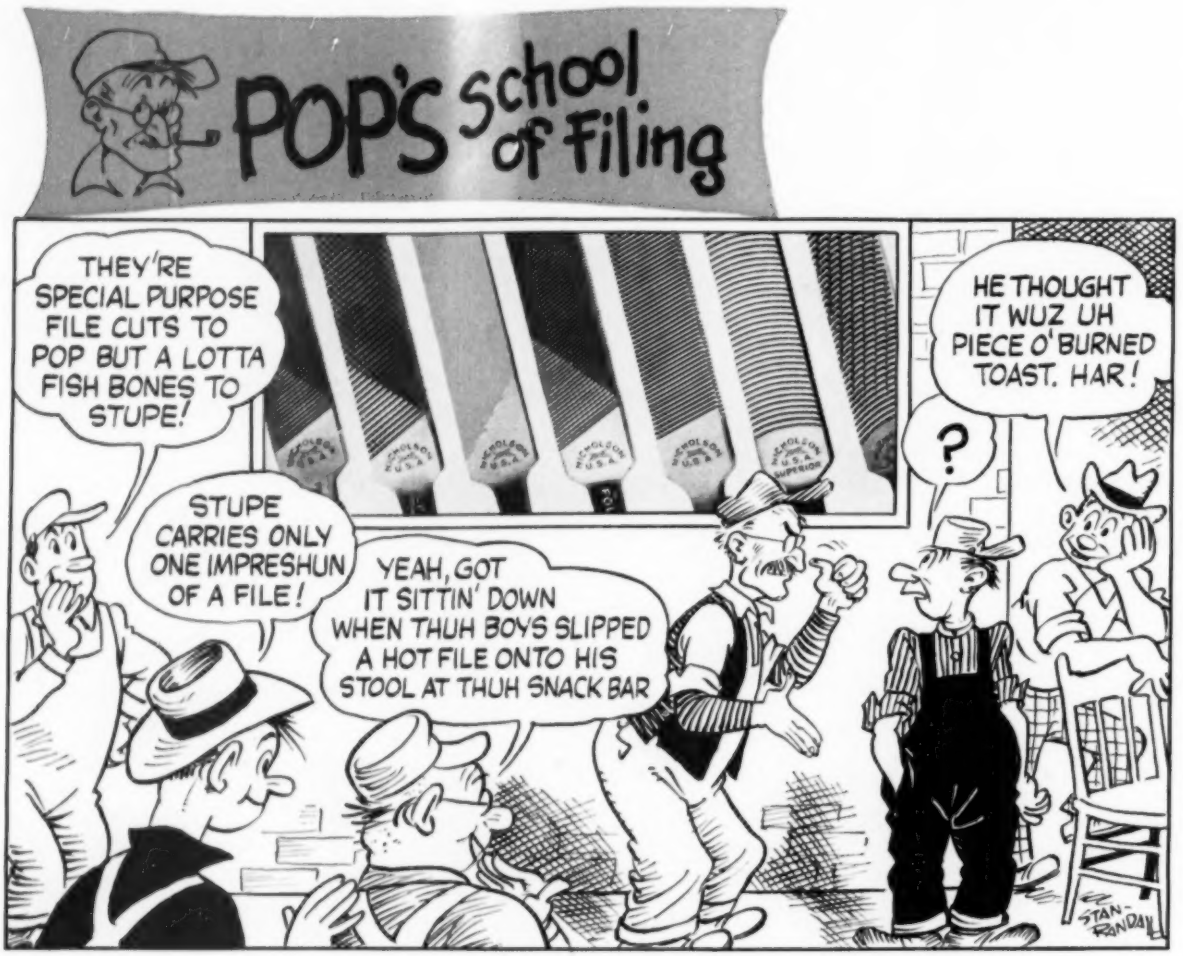
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OCTOBER
1953

VOL. 42 NO. 8

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

The Shop Teachers' Professional Magazine

Published on the 15th of the month preceding the date of issue by THE BRUCE PUBLISHING COMPANY, 400 North Broadway, Milwaukee 1, Wisconsin • CENTRAL OFFICE: 20 North Wacker Drive, Chicago 6, Illinois • EASTERN OFFICE: 225 Broadway, New York 7, New York.

★ ★ ★

Your 1953-54 Address

May we inform you once more that you will likely lose one or more issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION unless we have your correct address.

We must naturally send your magazine to your last year's address, if you do not send us a correction. Frequently such misdirected copies are not returned to us, and under present conditions of high material and labor costs we have to keep our press runs down as low as possible, and hence cannot send you a replacement.

Please send us your new address promptly, including the zone number, together with your former address.

This Month's Cover

The cover picture of the October, 1953, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION shows Professor Smith of The Oregon State College, Corvallis, Ore., pouring a 200-pound ductile iron ring. He is assisted by one of the students.

All molds in the university foundry are poured from a covered and insulated cylindrical ladle carried by a bridge crane.

★ ★ ★

Entered January 2, 1914, as Second-Class Mail Matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1953, by the Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, November 25, 1930. Published monthly except during July and August.

Subscription Information. — Subscription price in the United States, Canada, and countries of the Pan-American Union, $3.00 per year, payable in advance. Postage, foreign countries, 50 cents. Copies not over three months old, 35 cents; more than three months, 50 cents.

Discontinuance. — Notice of discontinuance of subscription must reach the Publication Office in Milwaukee, at least fifteen days before date of expiration. Notices of changes of address should invariably include the old as well as the new address. Complaints of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for upon publication. In all cases manuscripts should be accompanied by full return postage.

Articles Indexed. — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

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ASSOCIATION NEWS

COMING CONVENTIONS

Oct. 2–3. Four-State Industrial Arts and Vocational Education Conference, at Kansas State Teachers College, Pittsburg, Kans. Chairman, Doyle Kemper, Springfield, Mo.

Oct. 12–15. Future Farmers of America, at Municipal Auditorium, Kansas City, Mo. Secretary, A. W. Tenney, Office of Education, Federal Security Agency, Washington 25, D. C.

Oct. 15–17. Maryland Industrial Education Association, Division of MSTA, at Hotel Lord Baltimore, Baltimore, Md. Secretary, Milson C. Raver, 5 E. Read St., Baltimore, Md.

Oct. 15–17. Maryland Vocational Association, at Lord Baltimore Hotel, Baltimore, Md. Secretary, Milson C. Raver, 5 E. Read St., Baltimore, Md.

Oct. 19–23. National Safety Council, at Conrad Hilton Hotel, Chicago, Ill. Secretary, R. L. Forney, 425 N. Michigan Ave., Chicago, Ill.

Oct. 23. New Mexico Vocational Association, at Albuquerque, N. Mex. Secretary, Miss Evelyn Gose, 4200 E. Roma, Albuquerque, N. Mex.

Oct. 29–30. Minnesota Vocational Association, at Hotel Radisson, Minneapolis, Minn. Secretary, A. Donald Beattie, 488 Wabasha St., Shubert Bldg., St. Paul, Minn.

Oct. 29–30. Oklahoma Industrial Arts Association, at Capitol Hill Senior High School, Oklahoma City, Okla. Secretary, Cary L. Hill, A. & M. College, Stillwater, Okla.

Oct. 30. Virginia Vocational Association, at Virginia Education Association, Richmond, Va. Secretary, Richard Almarode, Suffolk High School, Suffolk, Va.

Nov. 5. Iowa Vocational Association, at Hotel Savery, Des Moines, Iowa. Secretary, Mark Z. Hendren, State Office Bldg., Des Moines, Iowa.

Nov. 5. Wisconsin Industrial Arts Association, at Auditorium, Milwaukee, Wis. Secretary, Leo Ebben, High School, Kohler, Wis.

Nov. 12–14. Mississippi Valley Industrial Arts Conference, at LaSalle Hotel, Chicago, Ill. President, Verne C. Fryklund, Stout Institute, Menomonie, Wis.

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Personal News

CLAUDE E. NIHART RETIRES

Claude E. Nihart was born in White City, Kans., November 8, 1887. He received his elementary education in Kansas and Oklahoma. In 1900 the family moved to Edmond, Okla., where he attended the Preparatory Department of the Central State Teachers College. From 1905 to 1907 he took his teacher's training at the same

Claude E. Nihart

institution. He attended Stout Institute in 1908–09. After coming to California he continued his education at the University of California at Los Angeles and received his B.E. degree there in 1927. At the University of Southern California he took graduate work toward general secondary and administrative credentials. In 1952 he was given an honorary Master of Science degree from the San Jose State College.

His professional career includes one year at Menominee, Mich., 1907–08, where he taught manual training. After graduating from Stout Institute in 1909 he went to Billings, Mont., where he taught in the high school for two years. He came to Los Angeles in 1911 and taught woodwork in the Manual Arts High School until 1916.

(Continued on page 6A)

NEW SCHOOL SHOP PLANNING GUIDE

by DR. JOHN L. FEIRER of WESTERN MICHIGAN COLLEGE of EDUCATION

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PERSONAL NEWS

(Continued from page 4A)

From Manual Arts he was transferred to Lincoln High School where he served as head of the industrial-arts department until 1924. Franklin High School was his next position of service where he again was department head until 1927. During five years of the time that he was at Lincoln and Franklin High Schools he was part-time evening school principal. He taught for nine years in summer sessions at the University of California in Los Angeles and Berkeley. In 1927 he was appointed supervisor of junior and senior high school industrial arts; and then in 1936 he became head supervisor of vocational and practical arts. This latter position he has held until his retirement, July 1, 1953.

He has served as president of the California Industrial Education Association and the Council of Directors and Supervisors, Los Angeles City Schools. He is a life member of the American Vocational Association and has served on the Policies Committee of the Industrial Arts Section. He has appeared on national programs of both the American Vocational Association and the Association convention in 1953.

He is an honor member of Epsilon Pi Tau and trustee of the Alpha Field Chapter. He has been given the responsibility by the National Office for organizing Field Chapters. The Ship's Citation was awarded him at the California Education Association Convention in 1953.

He has written over forty articles for the fields of industrial arts and vocational education, and the *American School Board Journal*. He was editor of *Shop News*, a professional publication distributed to teachers, supervisors, and administrators in the Los Angeles area.

Mr. Nihart is chiefly responsible for the development of exceptionally well-rounded programs of industrial arts in the elementary and secondary schools of Los Angeles, Calif. These programs have gained national recognition.

Since his retirement he has accepted the position of head of the industrial-arts department at the Los Angeles State College of Applied Arts and Sciences. He will have the responsibility of organizing and developing a new teacher-education program in this institution.

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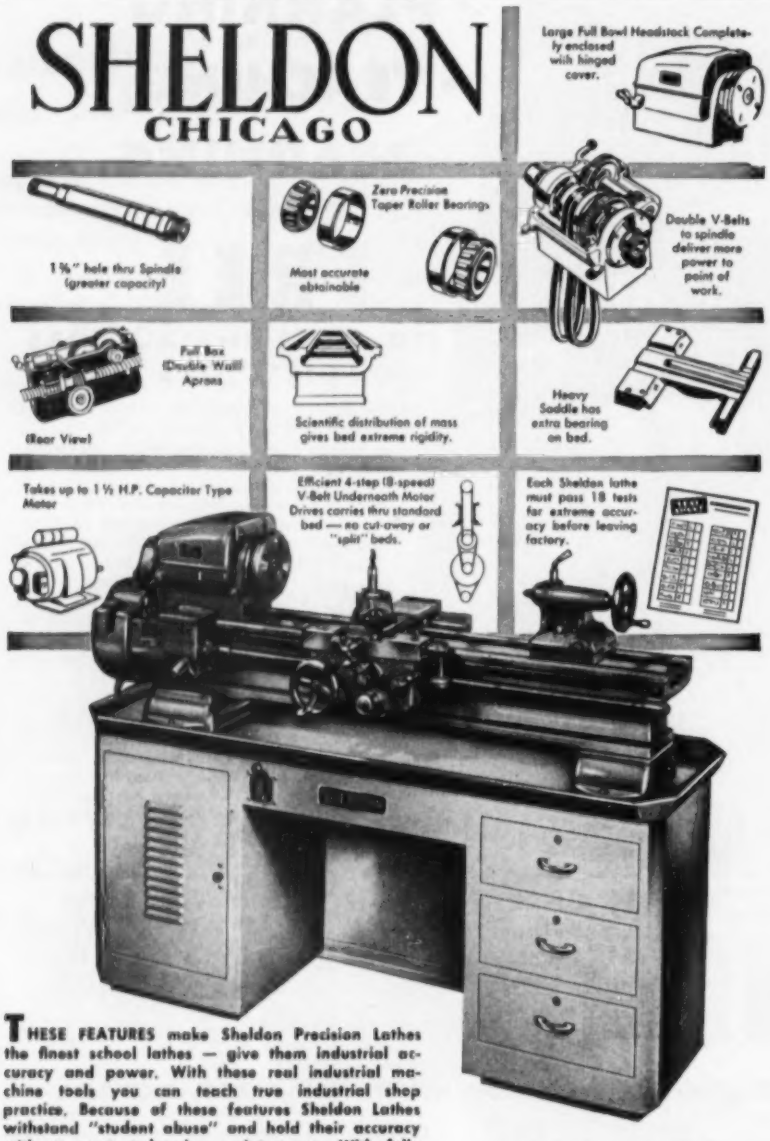
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WRITE FOR CATALOG

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♦ DR. HARRY STANLEY ROGERS, president of the Polytechnic Institute of Brooklyn, has been elected successor to Dr. Kenneth Holland on the guide service committee of the American Association of the United Nations.

♦ WILLIAM A. CASLER, assistant director of research, has been named manager of program development at Armour Research Foundation of Illinois Institute of Technology.

♦ SEBASTIAN J. NICOLOSI, ordnance engineer at the Aberdeen Proving Ground, Md., has been appointed research engineer in the mechanism and propulsion department at Armour Research Foundation of Illinois Institute of Technology, Chicago, Ill.

♦ HARVEY J. FRIEDLAND, 29, designer for Acme Tool and Supply Co., has been appointed design engineer in the mechanism and propulsion research department at Armour Research Foundation of Illinois Institute of Technology, Chicago, Ill.

♦ C. R. WILKEY, Arkansas State Supervisor of Agricultural Education, has been appointed secretary-treasurer of the Arkansas Vocational Association, to replace S. D. Mitchell, who has accepted a position with private enterprise.

♦ TONY STORTI, football coach at The Stout Institute, has resigned to take a similar position at Montana State College, Bozeman, Mont., effective May 1, 1952. He will return to the University of Wisconsin this summer to complete work on his master's degree.

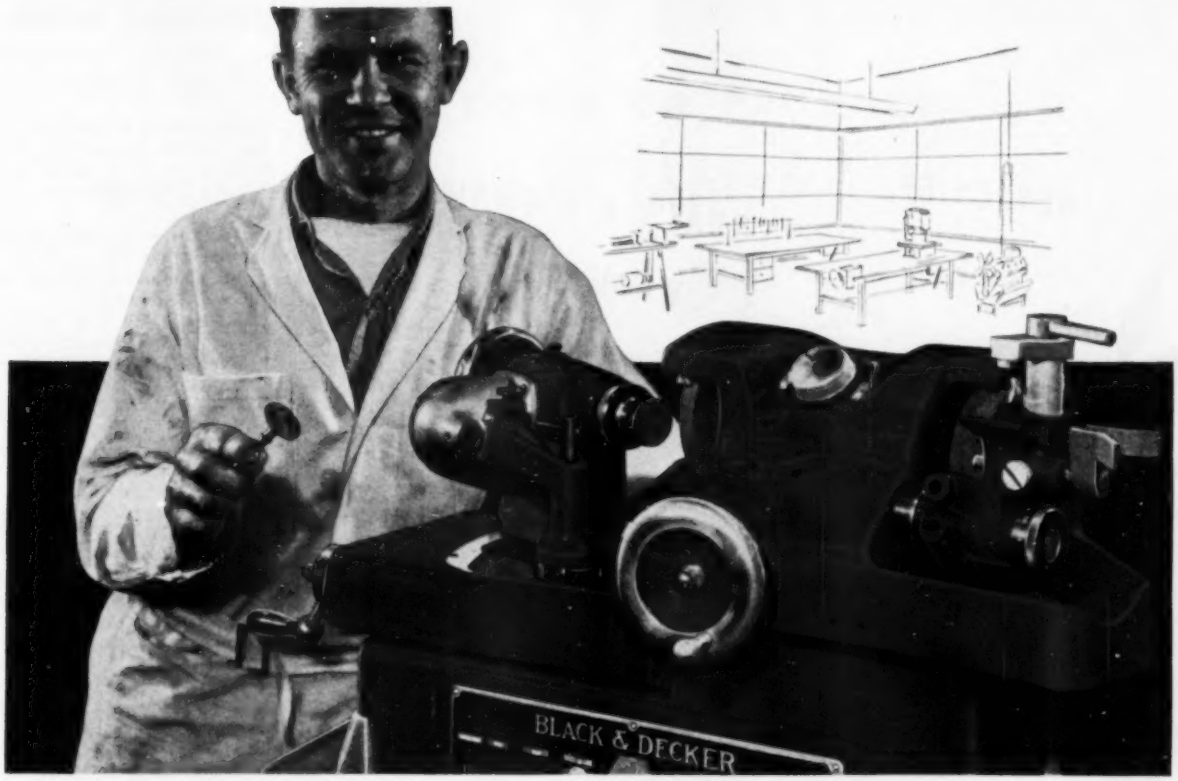
♦ LEWIS LARSON, science teacher at Council Grove, Kans., has been appointed to serve as local director of the evening program by Supt. K. O. Esping. Several classes have been organized for Beech Aircraft Corporation employees who live in Council Grove. Locally supported typing and shorthand classes are also in operation.

♦ ALTON D. HILL has returned to the United States after seven years of service to vocational education in Europe. For the past two and one half years he served as vocational education adviser to the U. S. High Commissioner for Germany.

♦ PRICE E. CLARK of Charleston, W. Va., formerly assistant state supervisor of secondary schools in charge of driver education, has been appointed educational director of the Association of Casualty and Surety Companies' accident prevention department.

He was one of the nation's first state directors of driver education to set up that subject as an integrated part of the curriculum with a full accredited course. He succeeds the late Merrill C. Yost, who died less than a year after he joined the Association.

(Continued on page 8A)



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PERSONAL NEWS

(Continued from page 6A)

♦ R. H. Acosta has been named assistant director of the Jefferson Parish Trade School at Gretna, La. A new schedule of classes for the fall and winter season is being prepared by Joseph Turner, school director.

♦ Victor J. Danilov, former newspaperman and journalism professor, has been appointed supervisor of public information services for the Illinois Institute of Technology.

He came to Illinois Tech from the University of Kansas where he was an assistant professor of journalism. He formerly taught journalism at the University of Colorado.

Mr. Danilov received a bachelor of arts degree in journalism from the Pennsylvania State College and a master of science degree in journalism from Northwestern University.

♦ William Scott, 40 years old, senior teacher at the Bath Academy of Art, Bath, England, is this year's guest instructor at the Banff School of Fine Arts in Canada. The British Council selects suitable British art instructors for the six-week course under the sponsorship of the University of Alberta.

♦ Lawrence Daughhetes, graduate of Sul Ross State College, will teach industrial-arts work in the lower Rio Grande Valley at Edinburg.

♦ David Shuler, graduate of Sul Ross State College, will open a new industrial-arts program at the High School, Callahan Co., Texas.

♦ Donald Pound has been added to the industrial-education staff at Indiana State. He is teaching Trade and Occupation Analysis.

Mr. Pound has been director and co-ordinator at Hobart, Ind., for several years. He is a graduate of Indiana State and Purdue. Mr. Pound will be responsible for field-service work in industrial education in the southern half of the state and also teach some campus classes.

♦ J. E. Bardelmeir, director of the St. Louis County, Mo., Vocational School since 1941, died recently.

♦ J. W. Dirkson retired after 32 years of teaching. He was an instructor at Kent University, Kent, Ohio.

♦ George T. Hart, teacher of printing at Benjamin Franklin High School, Rochester, N. Y., retired after 37 years of teaching.

♦ Robert M. Worthington has served in the machine-tool laboratory, Purdue University, Lafayette, Ind., for the past school year as instructor of manufacturing processes.

He received his M.A. degree in June, 1949, from the University of Minnesota and taught machine-shop practice at the Johnson High School, St. Paul, Minn., from September, 1949, to 1952.

♦ Margon Berg teaches driver training, woodwork, mechanical drawing, and physics in the Stanwood, Wash., schools. He also teaches aduit classes in driver training and woodwork.

♦ J. R. Payne teaches cabinetmaking in La Crosse, Wis.

♦ Lloyd W. Erpenbach is the senior training supervisor of the industrial relations division of the Marine Corps school in Quantico, Va. He was recently transferred from the U. S. Naval Ammunition in the Hawaiian Islands.

♦ Louis T. Below is working with some other teachers planning a $2,000,000 senior high school in Vancouver, Wash. He teaches in a vocational school in Vancouver.

TOOL ROOM OR PRODUCTION–
SPEEDS FOR CARBIDE TOOLS–
MEDIUM SIZE CAPACITY–

With FEATURES AND RANGE NORMALLY FOUND IN LARGER LATHES

Usually only in larger, more costly machines do you find the combination of speeds, swing, power, feeds and threads that are standard equipment on Rockford Economy Lathes. These features make it possible to machine a wider range of work with fewer non-productive hours than is possible with many machines in its class.

Medium-sized and economy-priced, it's built to handle any job that can be turned or threaded within 16-1/2" or 18-1/2" swing, and 30" to 102" center distance. 3100 lbs. of weight, 6' bed and zero precision bearings furnish the rigidity and precision for turning out tool room accuracy.

Ask a Rockford Machine Tool Co. representative to give you full details on these machines, or write direct for our new bulletin No. 900G.

ROCKFORD ECONOMY LATHES—16" and 18"

MEDIUM-SIZED
ECONOMY-PRICED

529

ROCKFORD MACHINE TOOL CO.
2500 Kishwaukee Street, Rockford, Illinois

AMES PORTABLE HARDNESS TESTER MODEL 1 WEIGHS ONLY 1½ POUNDS AND HAS 1" CAPACITY. OTHER MODELS OF GREATER CAPACITY. FURNISHED COMPLETE WITH BALL AND DIAMOND PENETRATORS, ANVILS, AND TEST BLOCKS, IN WOODEN CARRYING CASE, FOR TESTING DIRECTLY IN ALL ROCKWELL SCALES.

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Ames PORTABLE HARDNESS TESTERS

All engineering students should understand Rockwell Hardness Testing of metals. It is an important subject which can now be taught in the classroom with Portable Hardness Testers.

They are light in weight, easy to use, durable and very accurate. Hundreds of them now used in industry. Students become familiar with hardness testing and many practical applications. Write for Hardness Tester booklet and complete information.

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MODEL 8C

CUTS 8-INCH ROUND, 16-INCH FLAT, 8-INCH PIPE

Model 8CW Shown

METAL CUTTING BAND SAW

AN ALL-NEW DESIGN! NEW OPERATING EASE! NEW ACCURACY! NEW SAFETY!

Product of *Kalamazoo* experience and the best industrial design talent, Model 8C is the saw you'll want for your school shop. Designed for regular industrial use, Model 8C meets the highest school standards for operating ease, accuracy, dependability *and* safety. Available with casters for easy portability. Get the *facts* and you'll get *Kalamazoo*. Write today.

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BIG NEWS!

Both *Inch-Pound* and *Foot-Pound* Models of Amazing PROTO Torquer Now Available!

Announced in January! Over 30,000 bought by March 31!! That's the whirlwind success story of the sensational PROTO torque-*limiting* wrench. In addition to foot-pound models, you can now buy *inch-pound* styles and these handle thousands of jobs. Buy the model you prefer from your PROTO dealer today! Send 10¢ for 68-page catalog of entire line to

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PROTO TOOLS

Eastern Factory: Jamestown, N.Y.
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Rider College Chooses DELTA Power TOOLS for its Management Laboratory

Unerring accuracy, proven dependability, low operating and maintenance costs called major factors in success of project.

Established 87 years ago for teaching the fundamentals of modern business practices, Rider College of Trenton, New Jersey, maintains a Management Laboratory directed by Prof. Rocco J. Battista and equipped with a Delta lathe, 14″ drill press, 14″ band saw and 6″ jointer.

Going far beyond the usual definition of the term "Vocational," Rider not only stresses technical skills and methods, but also seeks to inculcate sound concepts of production control and shop management; and looks upon its Delta equipment as a major factor in the widely acknowledged success of its program.

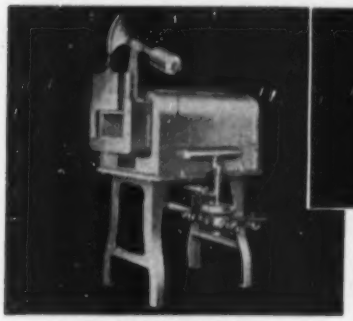
Delta tools were selected, says Prof. Battista, for their dependable accuracy, durability and low cost of operation and maintenance. Furthermore, Rider College expects to purchase additional Delta equipment to implement a course on the elements of time and motion studies in plant maintenance work.

It's an axiom of veteran vocational educators that for day-in, day-out reliability you can't beat Delta Power Tools. Ask your Delta dealer (he's listed in your Classified Telephone Directory under "Tools") about them—or write direct for latest catalogs to Delta Power Tool Division, Rockwell Manufacturing Company, 402K N. Lexington Avenue, Pittsburgh 8, Pa.

DELTA MILWAUKEE *DELTA QUALITY MAKES THE DIFFERENCE!*

DELTA QUALITY POWER TOOLS

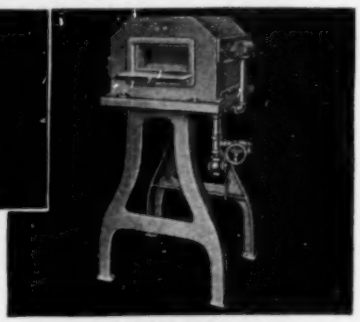
Another Product of **Rockwell**



Small Semi-Muffle Oven

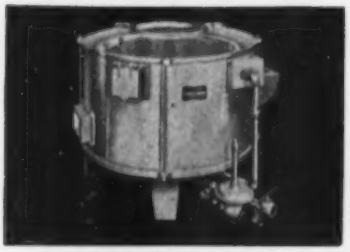
Sunbeam STEWART

THE BEST INDUSTRIAL FURNACES MADE



Small Forge

HUNDREDS OF THESE SUNBEAM STEWART FURNACES ARE IN THE VOCATIONAL DEPARTMENTS OF TECHNICAL SCHOOLS



Round Pot Furnace

Because Sunbeam Stewart units have been designed for efficient production heat treating in small shops and tool rooms, they are widely recognized as standard equipment for all types of industrial heat treating and vocational training work. For student instruction and reference, write for our free "Guide to Furnace Selection." Aids in determining the type of furnace best suited for any work. Also ask for the new Data File on school units.

SUNBEAM STEWART INDUSTRIAL FURNACE DIVISION OF SUNBEAM CORPORATION (Formerly CHICAGO FLEXIBLE SHAFT CO.)

Main Office: 4433 Ogden Ave., Dept. 114, Chicago 23, Ill.
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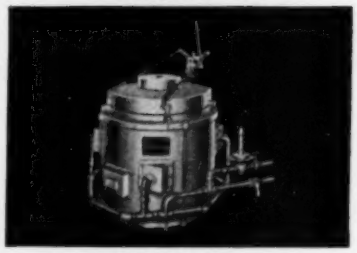
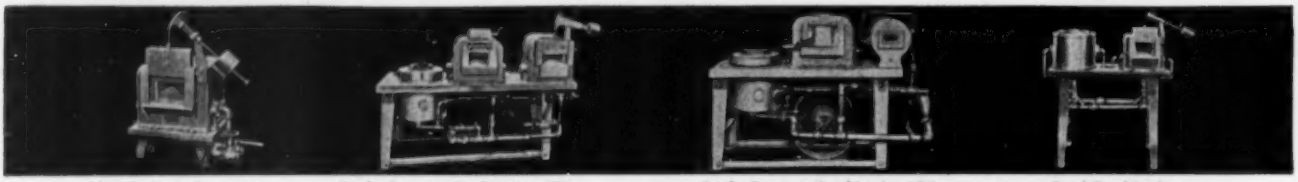
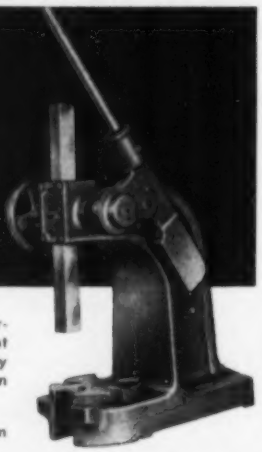


Melting Furnace



Bench Oven Furnace — Triple Purpose Combination "E" — Triple Purpose Combination "D" — Dual Combination

Economical ARBOR PRESSES FOR SCHOOL SHOPS



An ideal press for school shops requiring pressures up to 3 tons. Just the right size to handle practically all work usually found in these shops. Also widely used in all kinds of industry.

HAND WHEEL — Advances the ram to the work quickly and easily.

ADJUSTABLE HANDLE — Position is adjustable with a ratchet.

COUNTERWEIGHT — Keeps handle in uppermost normal position.

AUTOMATIC BRAKE — Automatic pressure brake holds ram in any position.

MACHINED TABLE — Large surface provides accurate work support.

SQUARE RAM — Heat-treated ram with large bearing surfaces and shimmed cap to provide long wear.

For more detailed information on this and other size presses, write for the illustrated Dake Arbor Press Catalog.

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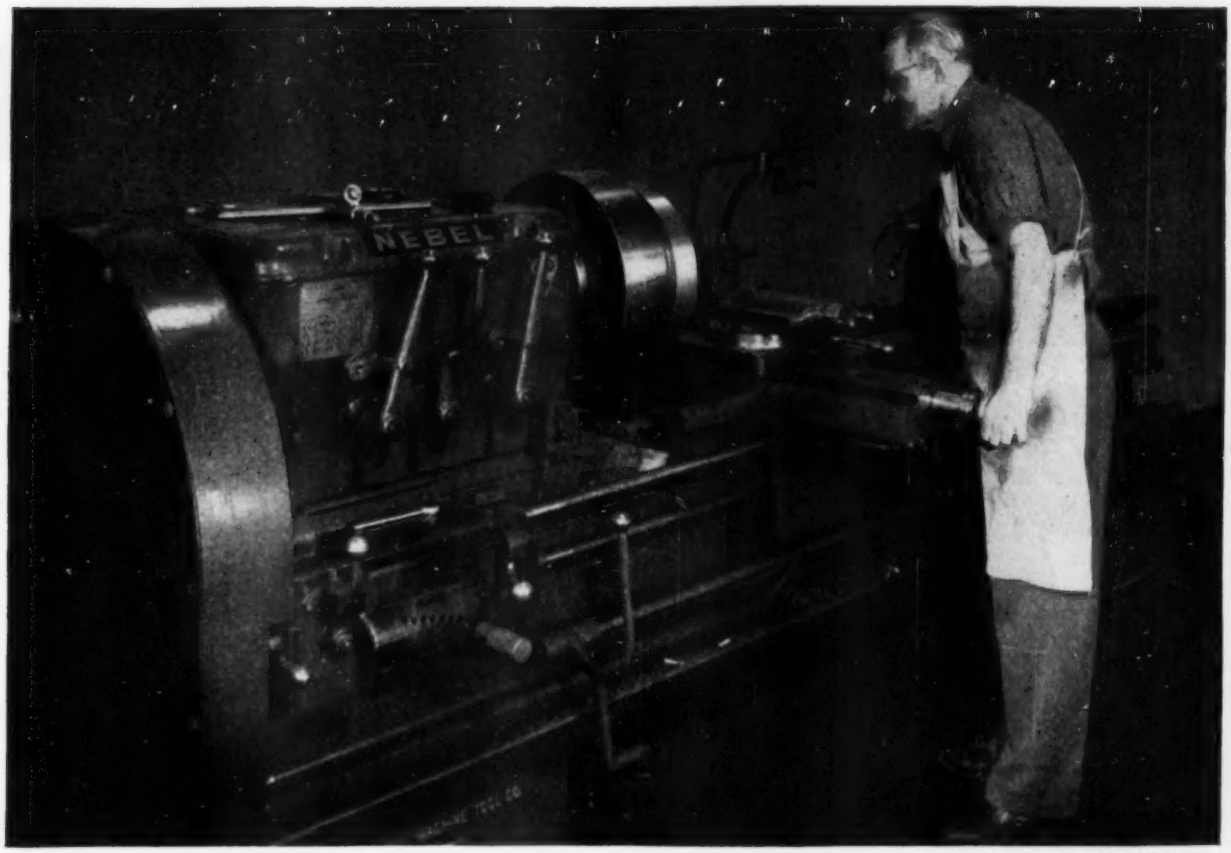

photo courtesy University of Cincinnati

figure on Nebel *workhorse of the school shop!*

SCHOOL SHOP: Nebel lathes give students the best preparation for the job ahead.

FACTORY SHOP: Nebel lathes provide more economical maintenance and production.

The same Nebel lathes that have been so widely used by the metalworking industry since 1899 . . . are perfect for shop training. They make it easy to teach lathe operation, and at the same time, give the student the most realistic training.

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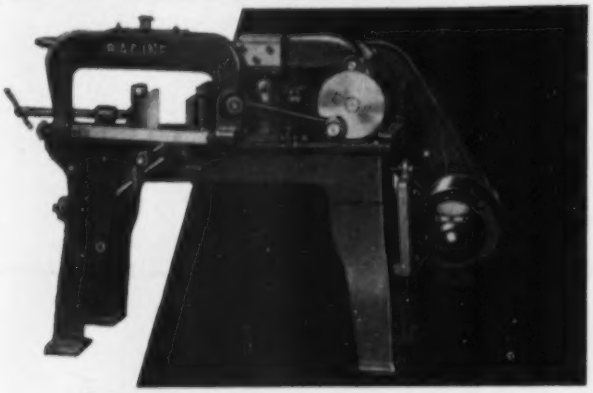

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Your EASIEST SAW TO USE and DEMONSTRATE. Students learn to operate it quickly.

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Write us about your training machinery needs. Also ask for our complete metal saw line catalog. Address RACINE HYDRAULICS AND MACHINERY, INC., 2070 Albert Street, Racine, Wis.

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This modern furnace gives you the temperatures you want for heat treating carbon and high speed steels, tools, dies and small metal parts. Fast warm up saves classroom time. Easily regulated with accuracy. Uses natural, mixed, artificial, or bottled gas. Very economical in operation. Firebox 5 x 7¾ x 13½. Complete with Carbofrax hearth, G.E. motor and Johnson blower.

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YOU WILL FIND STERLING FLASKS IN MORE THAN 4500 FOUNDRIES

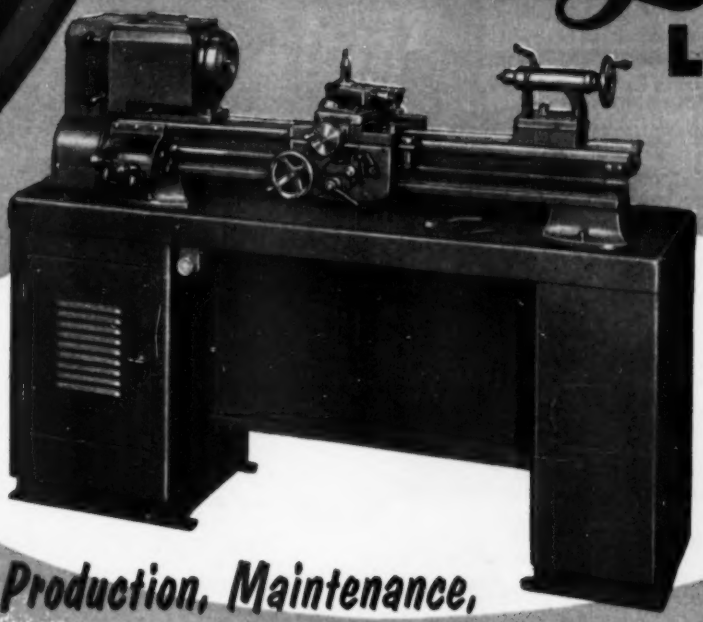
The stack molding technique, illustrated here, was made possible by using Sterling flask sections to step up casting production. Ten flask sections are being poured at a time. A common sprue through the stack feeds the molten metal to runners leading to individual castings cavities.

Sterling Steel Flasks are ideal for stack molding because they are built to withstand terrific pressures. A reinforcing rib around the side prevents distortion and misalignment of the stacked molds. Top and bottom have solid sand flanges. Full width bearing.

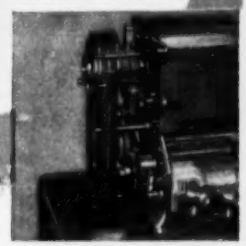
Write for new catalog describing the complete Sterling line.

STERLING WHEELBARROW CO. Milwaukee 14, Wis., U. S. A.

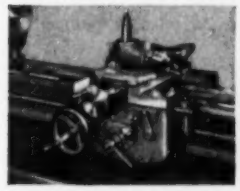
Presenting THE 12" SWING.. Logan LATHE



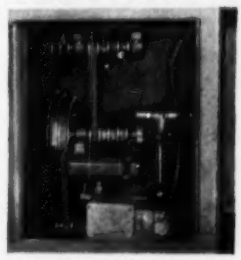
With FEATURES LIKE THESE



OUTBOARD V-BELT DRIVE
Double V-Belts transmit power to headstock with maximum efficiency and are easily accessible for change or adjustment.



NEWEST, FINEST CARRIAGE
Convenient, rigid, accurate, completely machined. Accurately machined and ground top surfaces on cross slide and saddle permit mounting fixtures and use of magnetic indicators. Apron operates in bath of oil. Simple, convenient, lever-operated disc type clutch.



UNDERNEATH V-BELT DRIVE
Jack-shaft and countershaft turn on ball bearing mounting. Motor and all parts are completely enclosed, yet easily accessible. Lever operated belt tension release.

For Production, Maintenance, Tool Room or Shop Work

IT'S BIG...

With 12" swing over bed and saddle wings, 1" collet capacity, 1⅛" spindle hole, and 35" center distances this newest Logan has the size to handle a major share of the average shop's lathe work.

IT'S RUGGED...

Its heavy headstock, massive spindle and rugged construction throughout make the 12" swing Logan a lathe of precision, stability and power.

IT'S VERSATILE...

Smoothly, without chatter, the 12" swing Logan Lathe hogs out amazingly heavy cuts. It is equally effective in high speed production and second operation work. Sustained accuracy at all spindle speeds (38 to 1260 rpm) is inherent in the ball bearing spindle mounting. This fact plus features like extra large compound and cross feed dials adapt it to exacting tool room operations. Its durable construction and enclosed design are important advantages in the school shop.

IT'S ACCURATE...

The wide-spaced, oversize ball bearing spindle mounting means *sustained* accuracy. Total spindle run-out, 12" out from the bearing is less than .0005". The 6 15/16" wide bed is heavily ribbed for rigidity. 2 V-ways and 2 flat ways precision ground to within .0005". Extra large dials on the new carriage permit accurate readings. Precision built throughout.

IT'S SIMPLE TO OPERATE...

No spindle adjustment is required for any speed from 38 to 1260 rpm. Dials are easy to read. All controls and levers are easily accessible. Outboard drive simplifies belt adjustment and change. Inexperienced operators and students quickly master this rugged, accurate lathe.

IT'S ECONOMICAL...

By the multiple economies it offers—investment, maintenance, space and power—the 12" Logan brings new economy and new profits to every type of lathe operation.

SEE THIS NEW LATHE AT YOUR LOGAN LATHE DEALER'S, OR

Write for Information...

Full catalog descriptions and price information on request.

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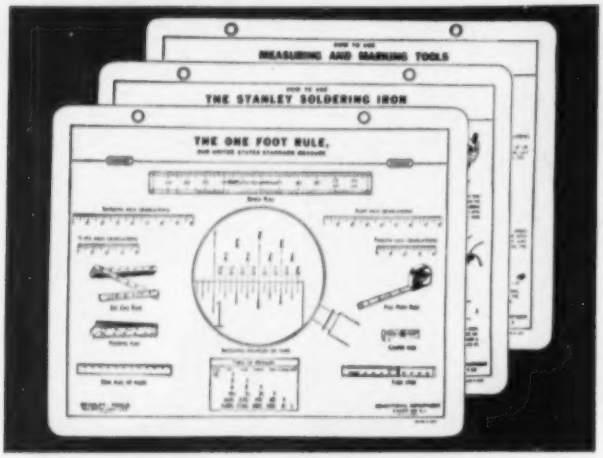
Start Classes Right!

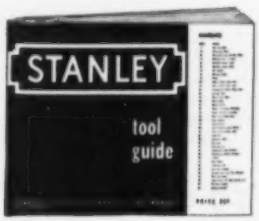
Use Stanley Instruction Charts



More and more shop teachers are finding Stanley instruction charts time-savers and effective aids for teaching and demonstrations. The charts now are larger size and six new ones have been added. 38 charts in all—they give all the important tool facts for common woodworking and several metalworking tools. And the extra large size, 27½" x 20½", makes it easy for a large group to read them. Order a set for your school—especially for beginners' classes. Sold at cost, $5.50 a set, delivered anywhere in the U. S. In Canada, $7.25 postpaid.

STANLEY TOOL GUIDE
(Revised Edition)

For your students, Stanley offers the Revised Edition of the Tool Guide. Pages carry the same material as the large charts described above—38 in all—and are perforated and punched for 3-ring notebooks. Single copies are $.25 in the U. S. Ten or more, $.15 each. In Canada, 25c each. Prices cover postage.



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with the *right* equipment

This all-purpose Shop Bench combines a large, smooth working surface with ample shelf storage space for tools and materials. Teaching is easier with a bench like this!

Laminated maple top is 1¾" thick, and is equipped with a steel backboard and end pieces to keep tools from sliding off. All-steel base furnishes utmost strength, permitting heavy load capacity.

Benches available in lengths of 8', 10', 12' (three legs), and 15', 16', 18' (four legs), or any multiple of these lengths. Depths, 24" or 30"; heights, 30¾" or 33".

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Another WALKER-TURNER "first"

For school shops, where neither the capacity nor expense of heavy industrial machinery is warranted, and where a "hobby machine" would be as impractical, Walker-Turner has engineered a special class of *light-heavyweight* wood and metal working machines.

Professional in design and operation, the Walker-Turner line gives industrial arts and vocational schools the needed accuracy, range of speeds, ease of handling, and extra safety for student operation, without a heavy investment.

For full details about the complete line of *light-heavyweights,* write to address below.

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Designed primarily for wood turning, the heavy cast iron headstock and double row pre-loaded spindle bearings make it an ideal machine for metal-spinning. Spindle speeds, changed while the machine is running, are controlled by hand wheel located in front of headstock. Speed range: 660-3550 r.p.m., in stepless gradients (using 1740 r.p.m. motor) Is indicated on graduated scale in plain view of operator. Capacity: Swing, 15½" over gap, 12" over bed, 38" between centers.

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Tough, lasting fine cutting edges for all types of woodworking. Various types of socket butt and firmer chisels with "Hardwear" green plastic or hickory handles. Outside or inside bevel socket gouges. Short and full length turning tools.

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There's a GREENLEE for every need . . . all types of twists and heads. Accurately sized, perfect cutting edges. Line includes the famous "Greenlee 22" Solid-Center Auger Bits which come to you "Plastic Sealed" for factory-sharp edges.

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Fast, easy-boring Expansive Bits with free, positive chip clearance. Specially-designed wide, open throat assures smooth, uninterrupted action. In two styles — Setfast with quick adjusting-locking feature and Plain.

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GREENLEE Spiral Screw Drivers are sturdily constructed and have special phosphor bronze drive nuts for long, hard service. Beautifully finished, three sizes. Automatic Push Drills have completely enclosed working parts and phosphor bronze drive nuts. Handle holds eight points. Chromium plated.

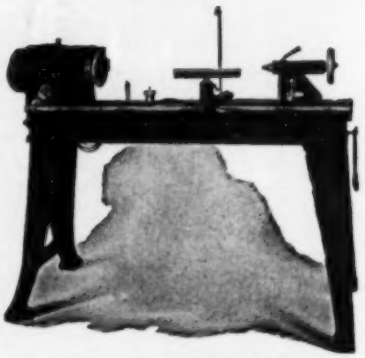
The GREENLEE line also includes Bit Extensions, Razor-Blade Draw Knives, Ship Augers, Electricians' Bits, Hand Benders for Tubing, Radio Chassis Punches, Knockout Tools and many other timesaving tools for the shop worker and the student.

TOOLS FOR CRAFTSMEN
GREENLEE

Free Folder H-301 with complete data on GREENLEE hand tools for the woodworker. Write Greenlee Tool Co., Division of Greenlee Bros. & Co. 2030 Twelfth Street, Rockford, Illinois, U. S. A.

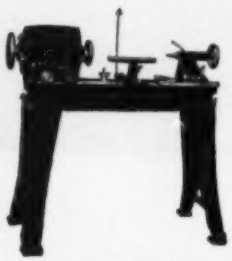
"Oliver" Lathes

make it easy to train your students right!



No. 159A SPEED LATHE

This Lathe is popular in school shops everywhere. It swings 12" diameter, 24" between centers. Has 48-inch bed. Unit type motor and V-belt driven headstock give speeds from 800 to 2750 r.p.m. Spindle lock simplifies removal of plates.



No. 51A SPEED LATHE

Has four-speed motor headstock — 600, 1200, 1800 and 3600 r.p.m. Enclosed sliding controller. Its smooth, accurate work is unmatched.

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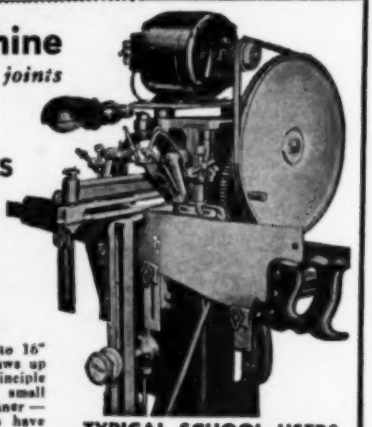

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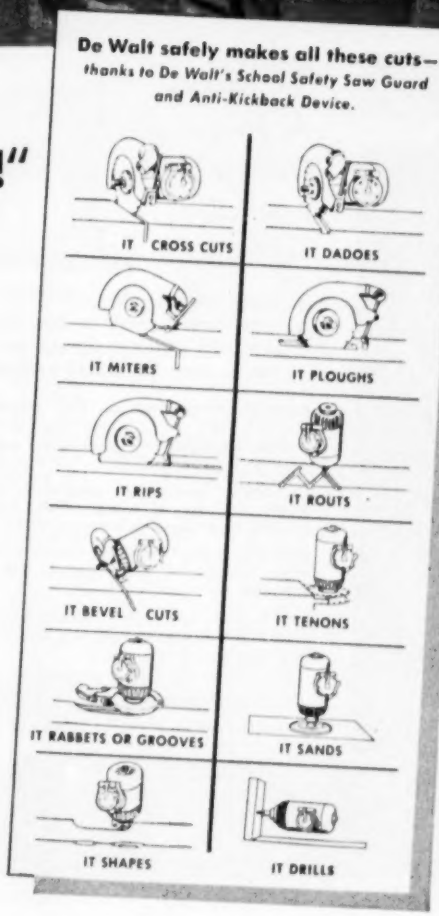

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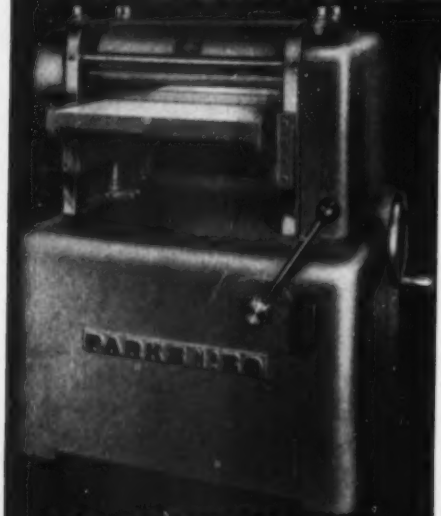

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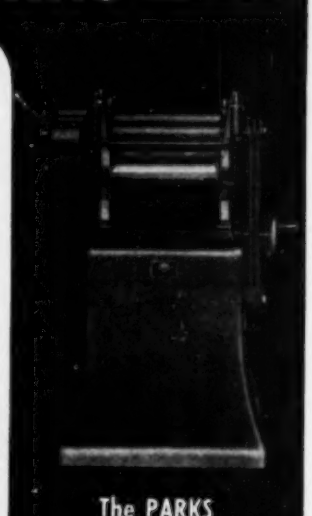

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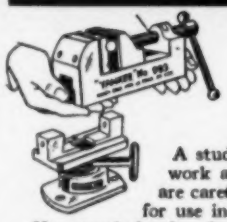

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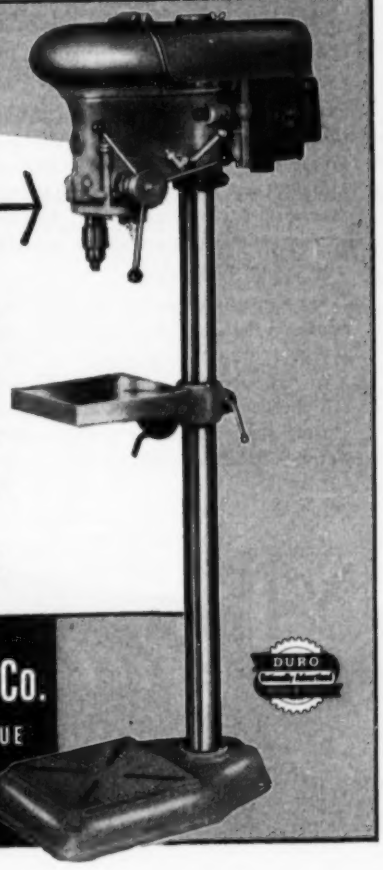

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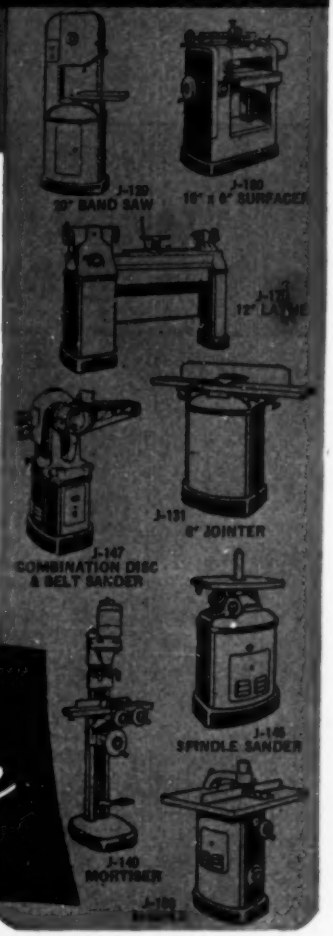

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION
The Shop Teachers' Professional Magazine
OCTOBER 1953

Teacher-Student Relationships—Two Patterns of Operation

G. BAYSINGER
Wayne University
Detroit, Mich.

Problems in Teaching

A problem is considered as a state of affairs which is disturbing to us and which resists efforts to bring about improvement. Although each teaching situation is different, the problems are similar; some are more disturbing than others, and some may disturb us more than they do other teachers. Here is a partial list common to most teaching situations:

a) Undue effort is required to establish and maintain discipline.

b) Quality of workmanship is unsatisfactory.

c) Wear and damage to tools, machines, and equipment are excessive.

d) An insufficient number of attractive projects is available.

e) Amount of educational achievement is not significant.

Attempts to deal with these problems directly are not too effective. When a student is inattentive or talks during a demonstration, for example, sending him out of the room may improve the situation temporarily, but the chances are that he will do the same thing at the next demonstration. Giving him a low mark on a poorly constructed project, does not necessarily improve the workmanship on his next one.

Then too, a direct approach to one problem not only fails to produce the desired results but involves the others. When discipline is poor, for example, projects are uninteresting, workmanship is unsatisfactory, and students show little concern for tools and equipment. Likewise, when tools and equipment are not in working order, workmanship is below standard, students lose interest in their work, and discipline requires more teacher effort.

Because of this interrelationship, problems cannot be dealt with effectively on a piecemeal basis. This suggests that they are not separate problems but different phases of the same problem which, for lack of a more comprehensive term, we call discipline in school and human relations in industry.

Broadly interpreted, discipline is the condition under which learning takes place; in a narrower sense, it is the extent to which the teacher maintains control of the class. In an activity program, in which students are not expected to stay in assigned seats or at work stations, we tend to consider discipline in the narrow sense. Failure to pay attention, talking during a lesson, horseplay during the work period, unwillingness to adjust to daily routine, and failure to complete assignments are kinds of student behavior which the teacher is unable to accept, but is compelled to do something about.

Traditional Practices

To such unacceptable behavior, teachers react in various ways. Some become annoyed, and resort to threats: "The next time I catch you doing that, I am going to send you to the office."

More experienced teachers avoid threats but coldly send the first offenders to the principal for the effect which it will have on others. "Let them know you mean business and you will have no trouble." In advanced classes or specialized programs, teachers may recommend that offending students be dropped since they are obviously unable to benefit from the instruction given.

Teachers who are hesitant about sending students to the office, feeling that to do so would reflect on their ability, hold the class in their seats for one or more periods or keep individual offenders after school. Teachers to whom punishment is disagreeable for one reason or another try friendliness with a personal touch, use projects and assignments which students like, and then reduce demands sufficiently to secure classroom conditions they can tolerate.

The disciplinary measures which a teacher uses are, of course, determined by school policies and his own individualized way of reacting to any annoying situation that may threaten his security or status. The use of punitive measures is easily rationalized: Children must be taught to obey; they have to learn what they can do and what they can't do. The consequence of doing wrong is a part of learning, both in school and in life. Our society is one of law and order, and to prepare young people to take their place in society, the school must subject them to restraints and punish-

ments in a modified form, but similar to those which society will impose upon them later.

But these are not the only solutions attempted. Most of us have had the experience of securing complete co-operation from a student, who has been annoying or unco-operative during a lesson, when relationships are on a one-to-one basis. Approach such a student at his work station, and you find him anxious to please and willing to accept special assignments which might be disagreeable or unpleasant. Basing their thinking on several experiences of this sort, many teachers are convinced that discipline problems are closely tied to handling students in groups, and organize their instructional programs to reduce the amount of group activity. The number of students that can be taught as individuals is, of course, much smaller, and the cost of operating such a program is excessive in comparison with other classes. But individual instruction is easily defended: Each child is different. His needs, interests, and abilities are different from those of others; the rate at which he learns also differs, and may vary from day to day. Good education then, should not subject all students to the same materials, expect the same achievements, nor use the same criteria for evaluating growth and achievement. Each child must be considered as an individual, and class size reduced accordingly.

Punitive measures, expulsion, appeasement, and reduction of group activity are solutions based upon teacher direction and control. As long as we tell students what to do, we have to follow through if we are to avoid a breakdown of authority. If we practice teacher direction and control, then we must also practice teacher enforcement of one sort or another.

Democratic Practices

In addition to teacher control, there are two other possibilities: group control, and no control at all which nearly everyone would reject. Group control is more acceptable, particularly if a substitute term, democratic process, is used. Because democracy is almost synonymous with voting, some teachers are likely to consider a democratic program as one in which details of operation are determined by discussion and a show of hands, and tend to reject this also as a waste of time.

But democracy is more than voting, and students engaged in discussion are also learning even though they may not be working with tools and materials. Democratic practices are not necessarily time consuming. They do, however, provide an alternative to teacher direction and control, and minimize the problems with which the teacher is most concerned; they require no special ability, and problems arise less frequently.

Help students uncover and clarify objectives.

Most teachers believe that learning is most effective when it is purposeful. Of course, the purpose of concern to us in a learning situation is that of the student. We may have a fine purpose in mind for him, but the one that motivates his learning is the purpose *he has in mind for himself.*

To help each student uncover his purposes is not difficult. If we present possibilities in terms of projects or jobs, and permit him to choose, he will select those which serve his purposes; such projects or jobs become immediate goals or goal objects. Secondary purposes or objectives, and remote goals are also of concern to us; these are products of experience and maturity and we can help in clarifying them later. Our first concern is to provide each student with an immediate goal of his own choice which can be a project to be made or a job to be done.

Encourage students to design projects and plan procedures.

A project is essentially the solution to a problem. If we need a place to study, we become interested in a desk, but just any desk will not do; ours must have space for a portable typewriter, a filing drawer, and other features. A desk which meets all of our requirements is not so much a piece of furniture as it is the solution to our problem; and because plans for such a desk are not available, we would draw them ourselves.

In encouraging students to design their own projects, we should emphasize this problem aspect. A beginning class of younger students, for example, may not be too interested in making a hot-pad holder shaped like a teapot, equipped with four brass cup hooks, and painted red. But interest would be sharpened if we were to raise such questions as: Where does your mother keep hot pads? Is that the most convenient place? . . . Drawers in which hot pads are now kept are too far from the stove; there is no place on the stove to hang them; and we don't want to drive nails in the plaster. . . . However, we can make a holder, and attach it to the wall. . . . Fortunately, we have plywood of appropriate size which could be used. . . . In designing your holder, you will want to give attention to shape, location of the cup hooks, color, and how you can hang it on the wall. . . . It would be a good thing to get your mother's opinion as you work out your design.

Not only is it helpful to point up the problem's aspects, but we should always introduce necessary limitations. In the illustration, we suggested construction details, limited the size, and proposed shaping the material with a coping saw. For every design there are limitations, and the experience and maturity of students will suggest those which you should introduce. Some of these are: size, shape, function, construction details, operations, and processes needed to form or shape component parts, assembly details, finish and color. More limitations are needed for beginning students to keep the design problem within their range of ability.

After students have designed their projects, they need some help in planning the procedures. These become, in fact, another problem: How should I make the project? Until students have had experience, we should plan with them; leading questions will bring out the necessary steps which students may write down for later use.

Organize the instructional program around the needs of the learner.

The best time to show the class how to sharpen a plane iron is when planes are dull. Such a lesson may be out of turn in a logical arrangement of subject matter, and very often is. Most teachers present information when it is needed because it is the natural thing to do, and knowledge of how we learn indicates that it is a sound practice.

For example, when a student's plane is dull or no longer produces a smooth surface, interest in his project is temporarily interrupted, perhaps he cleans out the chips, resets the cap, or tries adjusting the depth of cut. If we show him at this time how to sharpen a plane iron, he has a strong reason for learning. He listens attentively, and watches closely; at the grinder and oilstone, he is completely absorbed in producing a fine cutting edge. At this time, he was ready to respond in

a particular way. Psychologists use "set" or "readiness" to describe predispositions of this kind. In the past few years, *readiness* has assumed a larger share of attention in curriculum planning because of the significance it plays in learning situations.

Although we are inclined to present information when it is needed, we tend to present more than students are ready for. In showing the class how to sharpen the plane, for example, we might be tempted to broaden the lesson to include other bevel-edge tools. To guard against too much, it might be well for us to be suspicious of each item of information — Is this the best time to present it? Can the student go to work without it? Can I delay the information several days? Close decisions shorten the instructional period, and permit you to capitalize on *readiness* as it develops.

In addition to presenting information as needed, we should also *present only the information that is needed.* For most of us, information has utilitarian, rather than decorative or disciplinary, values. We might, in the previous illustration, tell students having their first experiences with planes about other kinds and their names, but this information would be of little value to them unless, for some reason, it was necessary for them to select planes from an assortment or catalog. Just as we questioned the timeliness of each item of information, we should also question its utility.

Although we may limit oral instruction to information having immediate value, we can provide written materials and suggest other resources for individual use. Most subject areas in our field are rich in historical, scientific, and interpretative materials. The amount of use which students elect to make of such materials is a good measure of teacher competency. Students who are stimulated to secure additional information from books, people and community resources profit more than those who are sent to the library to do reading assignments.

Our instructional program, then, should be organized around the needs of the learner. We should present only information that has immediate value, and we should present it as close as possible to the time when the need for it occurs. Then too, we should provide other instructional resources for individual study.

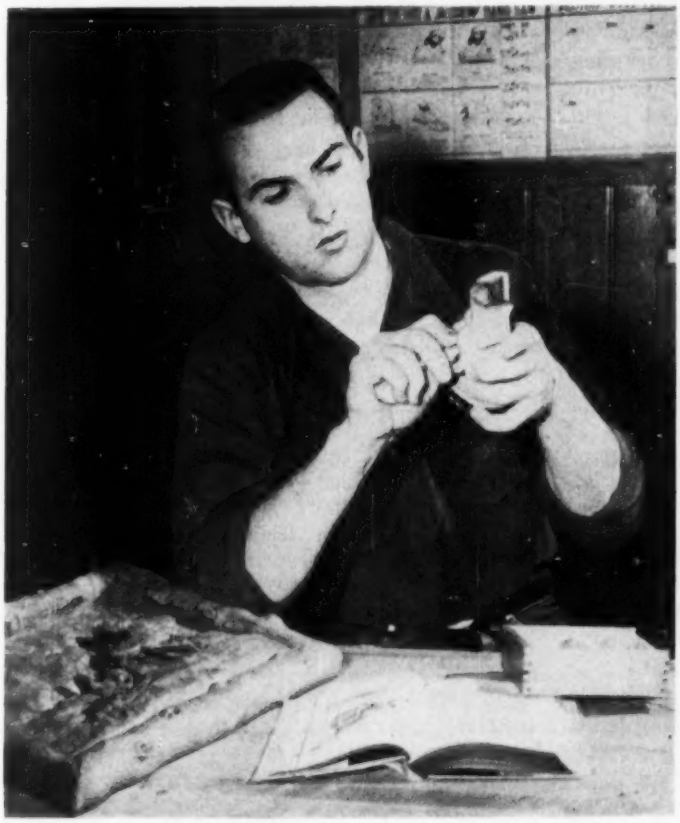
Permit students to participate in planning operational procedures.

Because of the amount of time and effort spent in the shop, most of us acquire a proprietary interest, and speak of *my shop,* and *my machines;* if cleanup is poor, we hang up the tools left on benches; if material storage is disarranged, we pick up the short ends and straighten the piles; and so on. As long as operational procedures remain our personal property, students are little concerned; but if we interpret them as the students' problems, which they are, the shoe is on the other foot.

Take safety, for example — in demonstrating a tool or machine operation to a beginning class, we include appropriate safe practices. Then we select a safety engineer, charge him with the responsibility of supervising students at work and, later, keep our eye on him to be sure that he does his job. Often, training and supervising him takes more time than supervising safety ourself, and it isn't as well done.

On the other hand, if we point out to the class that we will have little time, if any, to help students at their work stations now that we have safety to supervise, and then wish that there might be another way to do it, every student who is hoping for help from us would have a suggestion. As an end result, the class would propose a safety engineer, select one, and determine what his responsibilities were. He would represent the students, not the teacher; and if he was lax or inefficient, the class would let him know that he wasn't on the job. In other words, safety supervision would become their concern; and 25 or more students are not only more effective than one teacher, but student opinion has more influence than that of others.

For operational procedures, ranging from organizing the class at the beginning of the semester to determining final marks, we tend to plan all details ourselves so



Carving for the love of it. The 2 by 18-in. maple plaque was carved by a student who does this kind with his pocket knife

— Photograph contributed by George V. Radcliffe, head, industrial arts department, University of Idaho, Moscow, Idaho

that students may concentrate on manipulative work, and inadvertently structure the operation so completely that students have no choice but to conform either passively or with varying degrees of resentment. When the group plans the details, there is little need for us to spend time and effort to supervise operational procedures and enforce compliance.

In addition to being easier than directing the operation of the shop ourselves, group planning contributes to the growth and development of students who learn not only from the teacher but from each other as well. Students profit from group activity; we should use more group projects than we do, and we need to give more attention to the structure of the group and to the forces operating within it since these determine the role which the individual student must play and establish the difficulties and problems with which we must deal. It is not realistic to bury our head in the sand, ostrichlike, nor to persist in teacher-versus-students relationships. Inviting students to plan operational procedures with us opens up many possibilities for effective group work, and establishes relationships on a teacher *and* student basis.

Help students with personal problems. In concerning ourselves with students and their problems, we not only eliminate our own but open the door to relationships of a more personal nature. Students will come to us with specific problems, and with those which are vague and disturbing but nevertheless real. They may approach us casually as if passing the time of day, or as an offer to help with our never ending chores. Their conversation may or may not reveal what they have on their minds, but even our interest in their welfare gives them the security and assurance they need, and they leave with an improved outlook. If they do discuss a problem, our questions will usually bring out various solutions and possible results; in talking about it they frequently reach a solution themselves.

A few students may not approach us at all but reveal their difficulties by their behavior, acceptable and otherwise. These are our problem cases, and if we are to help, we must regard the behavior as a symptom rather than the cause itself.

Behavior is the outward expression of social and personal adjustment which, in turn, is a balance between the individual's purposes, needs, and desires; and the demands, pressures, and expectancies of environment. The balance is always shifting, it is individualized, and is always reasonable.

The student whose behavior is unacceptable to us is surprised that we would find it so, and he only grudgingly admits he is in error. His actions always appear justifiable to him, and any attempts to secure change are interpreted as discrimination of one sort or another.

To help, we must avoid a negative attitude toward him, be understanding and sympathetic and, if possible, reduce the demands which the school places upon him. We can encourage him to express likes and dislikes, and to develop new interests; we can structure a few situations so that he will have satisfying experiences with tools and materials, and with the group. If no improvement occurs, we should get help from his home-room teacher or counselor. In extreme cases, we may recommend that the student be referred to an appropriate agency for specialized treatment.

Comparisons: Traditional and Democratic

Throughout the discussion, the term *authoritarian* was avoided because everyone believes himself to be democratic, and would resent a suggestion that he was otherwise. But we do have these two kinds of teachers: those who believe that they are acting in the best interests of students when *they* do the thinking and planning, and those who believe the purposes of education are best served when students are led to do their own. The labels we use are not as important as the consequences to the teacher and to the students.

Observations taken from case studies covering a five-year period suggest a variety of alterations and changes which occur in teachers under each pattern of operation. Prevailing practice in the school, and previous experiences and personality needs, were influences in the choice of pattern to be followed. The observations are described briefly, and presented in two columns for easier comparison; no labels are used:

Chooses direction for the group in terms of his own needs and interests	Recognizes interests and needs of students, and attempts to provide for them
When challenged, relies on higher authority to sustain his point of view	Encourages the group to make decisions which he accepts and defends as worth trying
Believes himself to be best prepared to direct the program; rejects group participation as uneconomical of time and effort	Resists tendency to take charge when operation is in experimental stage; is patient, and has faith in students
Demands conformity, insists on prescribed conduct; uses intimidation and fear of punishment to secure obedience	Encourages individuality; accepts standards of individual and group behavior arrived at by common agreement
Attempts dominance of others; seeks to make them dependent upon him	Tries to develop in others: self-direction, self-reliance, and individual responsibility
Manipulates situations to reduce effectiveness of those who may challenge his status, position, or authority	Provides opportunities for students to improve status and relationships with other teachers; develops leadership

What happens to students under the two patterns is also of interest to us; observations from the cases studied suggest ways in which students adjust to the two patterns of operation:

Group stratifies according to usefulness; preferential treatment is given to those who may help improve teacher's status	Students insist on equality for all; place highest value on service to the group which all may achieve; recognize the worth of each individual
Students blame accidents and damage upon one least able to defend himself	Students face failures and accidents realistically; help less fortunate members
Communication goes underground; teacher gets information from those seeking personal advantage, but facts are colored to please the teacher who is often misinformed	Students communicate freely without fear of blame or reprisal; teacher knows what students are doing and what they are thinking

Program is well operated; behavior and quality of workmanship are maintained at the teacher's standards	Program is casual and less formal; standards of behavior and workmanship are those of students; workmanship is below the teacher's standard	Students reduce amount of contact with the teacher; avoid him outside of class	Students approach the teacher when help is needed; number of contacts is bothersome
		Are relieved when term is over; work may be good for them, but they want no more	Ask for another course; visit teacher frequently; continue their interest and activity

In putting observations into words, objectivity was attempted but bias is present and evident. This should be disregarded in comparing results and consequences of the two patterns of operation; both have advantages and disadvantages, both are attacked and defended. The solutions to the problems of the teacher, described earlier, are possible under either pattern; but initial choice is more influenced by prevailing practices in the school, previous experience, and personality of the teacher than by an intelligent understanding of the issues involved. Our choice should be deliberate and based upon what is known about learning and the function of education, rather than determined by circumstance, expediency, or personality needs.

Guiding Principles of Vocational-Industrial Related Instruction*

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Nature of the Problem

The purpose of vocational education is to prepare for effective work and to assist pupils to attain socially useful lives. If the vocational education curriculum is developed to attain these objectives, more recognition should be given by vocational administrators and teachers to the curriculum content and how it is developed, to methods of teaching, and to the program organization necessary. In the industrial education curriculum emphasis is placed on the development of skills, abilities, understandings, attitudes, working habits, appreciations, and the knowledge and information needed by workers to enter and make progress in employment on a useful and productive basis. It is with the teaching of trade knowledge and information, known as related instruction, that this study is concerned. It must be recognized that in the development of curricula for related instruction it is impossible to confine such a study to related instruction alone, for the skills and abilities of a trade are the soil from which related instruction is extracted through the trade analysis technique.

Whenever a person performs a manipulative task, it is almost always true that in the connection with the doing of that task some related knowledge will be used or applied. Manipulative skills performed are the backbone of a trade, but to perform these skills successfully requires a good background of related information. Vocational related information includes two types: (*a*) technical information without which manipulative skills could not be performed successfully, and (*b*) general related information of a mathematical, scientific, or drawing nature which is related to a trade and which a tradesman should have in order to adjust himself to trade and job requirements.

Wright[1] points out that as early as 1914 Dr. Charles R. Allen of the Massachusetts board of education presented to the National Society for the Promotion of Industrial Education at Richmond, Va., his philosophy of vocational curriculum construction based on the trade analysis technique. Dr. Allen's technique consisted of separating the skills from items of related information for a specific trade. This general practice of curriculum construction has been used throughout the years, but, as a result, the isolating of information into skills and knowledge has brought about a tendency to teach the vocational industrial subjects on the same compartmentalized manner. With the passage of the Smith-Hughes law in 1917, and the subsequent official interpretations[2] of the law by the Federal Board for Vocational Education, further emphasis was placed on the teaching of shop and related classes in

*Abstract of a Doctor's Dissertation at the University of Pittsburgh, June, 1951.

[1]Allen, C. R., Hambrecht, G. P., and Welch, R. L., *The Instructor, The Man, and The Job*, p. vii (Philadelphia: Lippincott, 1945).

[2]*Bulletin No. 1, Statement of Policies for the Administration of Vocational Education* (Washington, D. C.: Federal Board for Vocational Education, 1917).

separate laboratories and rooms; this practice has been followed generally throughout the years. In teaching shop and related information in separate rooms, the matter of high correlation of shop skills and related information is usually a problem of concern, for without a reasonable degree of correlation the related information which is taught can sometimes be of questionable value.

Statement of the Problem

This study has as its purpose the development of a list of guiding principles[3] for vocational related instruction. To develop such a list, an investigation has been made of current curriculum construction practices, administrative organization, and teaching methods of the all-day vocational-industrial related instruction program in a large eastern industrial state.

Nature and Source of the Data

The procedure followed in this investigation began with a search through the professional literature related to vocational-industrial and general education, and personal conferences with national and state industrial education leaders, vocational teachers, and students, for the purpose of identifying all of the possible principles relating to and actually influencing the vocational-related instructional program.

The check list technique was chosen as the means for obtaining the data, because it was a convenient form for tabular classifications of responses by the jury in the indication of present practice and the evaluation of the desirability or undesirability of each principle. No single philosophy of vocational education was permitted to influence the final selection of any principle. Each principle was stated in a concise manner and in a declarative form; in the case of certain principles, the form used was of the multiple-response type of statement.

A preliminary list of principles was prepared and submitted to 160 students in industrial teacher education classes to review for clarity, after which a tentative list of 248 principles was submitted to a sub-jury of 22 leaders of industrial education representing national, state, and local programs of industrial education outside of the state being studied, for their comments and criticisms of the organization of the check list; their comments and suggestions were incorporated into a final printed check list of 138 principles in three general areas of curriculum construction, administrative organization, and teaching methods of vocational-industrial education. These three areas were further classified into seven sub-areas to facilitate checking of the list; and following each group of principles, space was provided into which the jury members were asked to write in and check any principle not included in the list, which was thought to be pertinent to the classification.

The check list has provisions for checking each principle for the extent of practice of the principle under the captions "yes," "no," or "does not apply"; and for the acceptance of the principle under the captions "desirable," "undesirable," or "undecided." The check list was sent to the home addresses of a jury of 784 vocational administrators, and shop and related teachers in 77 vocational school districts in the state; this represented the total population of the vocational-industrial education programs, and all of the vocational staff members, with the exception of general education teachers, during the school year 1949–50. Five hundred or 63.8 per cent of the jury members, consisting of 93 administrators, 225 shop teachers, and 182 related teachers responded with check lists which were used in the study. The respondents were representative of 100 per cent of the industrial education programs of the state, and 93.2 per cent held valid teaching certificates.

THE RELATIVE ACCEPTANCE OF THE PRINCIPLES AND THE EXTENT OF APPLICATION OF THE PRINCIPLES OF VOCATIONAL-RELATED INSTRUCTION

This part of the study sought answers to the questions: (1) What is current practice in the vocational-related instruction program in the state, especially as it relates to curriculum construction administrative organization, and teaching methods? and (2) What principles do vocational educators consider important in curriculum construction, administrative organization, and teaching methods? Specifically, the area of curriculum construction included a study of: (*a*) determining curriculum objectives, (*b*) selecting the content for related instruction, and (*c*) curriculum revision; the area of administrative organization included: (*a*) program scheduling, and (*b*) physical facilities and program operation; and the area of teaching methods included: (*a*) methods of teaching, and (*b*) related-instruction teacher qualifications.

Treatment of the Data

In the check list the jury members were instructed to check each principle under "present practice" as to whether they did or did not follow the principle or whether the principle did not apply. In the case of the "evaluation" of the principle, jury members were instructed to evaluate each principle once, either desirable, undecided, or undesirable, regardless of the extent of practice of the principle and in spite of any possible administrative difficulty.

Since the study was to: (1) determine present practice according to the stated principles on the check list, and (2) to obtain the jury members' judgments of the principles, the interpretation of the data, so far as extent of current practice is concerned, is based on the number and per cent of the "yes" and "no" responses only; the "does not apply" responses are included in the data for information purposes. With regard to the relative acceptance of the principles, however, the interpretation of the data is based on all three factors of desirable, undesirable, and undecided. In computing the data, the terms "does not apply" and "undecided" were not included, for such responses did not constitute "yes" or "no," or "acceptance" or "rejection," of the principle.

Percentages were determined from the data for each principle under the headings of "Relative Acceptance of the Principle" and "Extent of Practice of the Principle." The data were tabulated and a brief interpretation was given for each principle.

It was found that the interpretations of the data resulted in a range of from relatively high degree of acceptance of certain principles to a low degree of acceptance in other principles. In certain principles there were enough respondents who were undecided that further study of these principles was indicated.

With respect to the extent of practice of the principles it was found that, in general,

[3] In this study the term "guiding principles" refers to a statement of empirical generalizations in which previous judgments of conduct have worked out as a part of general practice; they are hypotheses to be tested and revised by experimentation or long-established usage until they are or are not sound.

practice lagged behind theory. In some principles there was high relationship between theory and practice; in other principles, there was a high degree of acceptance of the principles and a low degree of practice, and with a relatively small number of principles there was great indecision about the desirability of the principles.

The implications from the written comments of the respondents and the additional principles suggested were: that there is a recognition of the need for the study of related instruction; apparently there are many problems connected with curriculum development, administrative organization, and the teaching of related instruction; correlation between shop instruction and related instruction is difficult to attain; there is uncertainty about the qualifications necessary for the teacher of related instruction; teachers feel a need for closer co-operation among shop and related teachers; and there is concern about the meaning of related instruction.

A list of 78 guiding principles of vocational-related instruction in the areas of curriculum construction, administrative organization, and teaching methods was developed as a result of the analysis of the data obtained.

CONCLUSION

Findings

The findings in the study reveal that there are many principles of vocational-related instruction with which vocational personnel are in high agreement as desirable principles to follow. In a number of principles there was high agreement between theory and practice, although in the case of many principles, practice lagged considerably or even greatly behind theory. The study reveals that there is uncertainty about the desirability of certain principles as indicated by a relatively high percentage of jury members who checked that they were "undecided" about those principles.

The findings of the study resulted in the following list of 78 guiding principles which are ranked highest to lowest by per cent of relative acceptance of the principles. The extent of practice is stated by per cent for each ranked principle. The principles are ranked within each general classification of Curriculum Construction, Administrative Organization, and Teaching Methods.

GUIDING PRINCIPLES OF VOCATIONAL-RELATED INSTRUCTION

Curriculum Construction

Classification, Rank, and Principle	*Per Cent Desirable*	*Per Cent Practice*
1. General and specific objectives are determined before building a course of study.	99.79	97.25
2. Specific objectives include provision for the teaching of attitudes and appreciations.	99.55	92.04
3. A technical library is available for teachers and students.	99.16	71.91
4. Special units of instruction are available for students who can profit by a special program.	98.67	59.48
5. Course revision is affected by the needs of industry.	98.65	73.45
6. Trade analysis determines the content for the teaching of trade terms and safety.	98.46	89.97
7. Special courses or advanced units are provided for students who can profit by such special treatment.	98.40	61.28
8. Trade analysis determines the content for the teaching of drawing and sketching.	97.71	77.77
9. Specific objectives include provision for the teaching of skills.	97.39	93.67
10. Basic course outcomes are stated specifically to students.	97.10	74.44
11. Trade analysis determines the content for the teaching of blueprint reading.	97.02	81.51
12. Trade analysis determines the content for the teaching of mathematics.	96.77	75.35
13. Objectives are determined by area needs.	96.61	76.15
14. Trade analysis determines the content for the teaching of science.	96.48	67.43
15. Related instruction is based on student needs as craftsmen and citizens, and is closely correlated with the manipulative phase of the trade analysis.	96.32	67.12
16. Related-instruction course material is derived from trade jobs and operations.	95.53	62.16
17. Related-instruction course material is developed according to student needs.	95.06	69.92
18. Specific objectives include provision for the teaching of knowledges.	95.00	96.80
19. Trade analysis determines the content for the teaching of manipulative skills.	94.70	83.53
20. Objectives are reviewed by competent persons in industry and vocational schools, before the course of study is built.	94.58	26.11
21. Course of study is revised by teachers and industry advisory committee.	94.00	61.68
22. Objectives meet the needs of all students.	93.53	66.28
23. Content for related instruction is selected by the shop teacher, related teacher, and industry advisory committee.	91.40	19.15
24. Objectives are determined by the school staff and industry advisory committee.	91.37	24.00
25. Departmental meetings are held to consider curriculum needs.	89.60	15.62
26. Trade analysis including related information is developed by the shop teacher, related teacher, and a skilled mechanic from industry.	86.65	21.18
27. Courses are revised continuously.	84.10	60.00

Administrative Organization

1. Mimeographing or other duplicating service is available.	99.60	91.00
2. Secretarial service is available for the preparation of instructional materials.	98.51	56.00
3. Showing of films is in properly equipped room.	98.00	57.14
4. Laboratory equipment is provided to meet the curriculum objectives for related instruction.	97.14	67.54
5. Applied science laboratories are provided in the vocational department.	96.20	48.70
6. Classrooms and shops are so arranged as to facilitate coordination between shops and related-instruction program.	96.06	35.70
7. Related teachers are scheduled for periodic shop visits with shop teachers.	95.34	18.15
8. Related classes are made up of students from one grade level.	94.55	72.00
9. A work space with library reference books and magazines is available in related classrooms.	94.34	42.80
10. A work space with library reference books and magazines is available in shops.	93.53	54.78
11. Shop teachers are scheduled for periodic classroom visits with related instructors.	92.80	10.08

Classification, Rank, and Principle	*Per Cent Desirable*	*Per Cent Practice*
12. Related classes are made up of students from one trade only.	92.66	33.34
13. Related-instruction laboratory equipment is purchased by the school district.	91.67	90.40
14. Related instruction is carried on in separate rooms adjacent to shop.	87.62	53.72
15. Courses of study are built by teachers on school time.	85.45	35.93
16. Related classroom furniture includes tables with chairs.	84.30	55.29
17. Shop theory is taught in a separate room in the shop.	84.27	29.09
18. Related classes are taught in rooms where students sit at tables according to determined groupings by trades or allied trades.	83.79	37.71
19. Students in related classes are grouped according to ability.	83.43	16.63
20. Related classes average 15 to 19 students per instructor.	81.11	29.50
21. Shop classes average 15 to 19 students per instructor.	76.47	49.76
22. Shop and related courses are scheduled on the one-week-about plan.	54.44	28.33
Teaching Methods		
1. Visual aids include the use of film slides and film strips.	99.99	82.31
2. Visual aids include the use of films.	99.12	91.52
3. Visual aids include the use of charts and graphs.	99.00	90.57
4. Visual aids include the use of models.	98.85	81.25
5. Related-instruction teachers observe shop work in industry.	98.61	42.65
6. Related instruction is taught through the use of textbooks, instruction sheets, and reference books.	98.45	81.42
7. Films and film slides are shown when needed.	98.44	74.00
8. Visual aids include the use of field trips.	98.43	72.48
9. Visual aids include the use of display panels.	98.40	77.78
10. Related-instruction teachers observe shop work in own school.	98.04	66.14
11. Remedial instruction is provided.	98.00	56.16
12. Provision is made for the exceptionally bright student by assigning him more advanced work.	97.48	78.19
13. Diagnostic tests are used.	96.95	57.45
14. Related instruction is taught by a combination of class and individual instruction.	96.35	74.24
15. Related-instruction teachers observe shop work in other vocational schools.	96.33	33.33
16. Visual aids include the use of mock-ups.	95.77	60.00
17. Related teachers have occupational experience in several wage-earning jobs.	95.56	69.95
18. The teaching method used is adapted to the individual differences of students.	95.00	63.13
19. When the program is large enough, a particular related teacher is paired with one or more shop teachers for better correlation of shop and class instruction.	94.00	18.12
20. In group related instruction, general principles are taught to the whole class, after which each student progresses according to his own ability.	93.35	78.99
21. A filing system of job assignment sheets is available to students in related classes so that each student can work at his own speed.	93.16	34.59
22. Home work in related instruction is assigned students when needed.	92.44	72.16
23. Competent laymen from the community and industry supplement the teacher when needed.	89.60	27.00
24. The progress for each student is recorded on a progress chart available for all to read.	87.67	53.40
25. Related-instruction teacher teaches the general principles and the shop teacher teaches the trade applications of those principles.	86.80	70.63
26. Related-instruction teachers work in industry during the summer vacation period at least every two years.	82.13	34.15
27. Related-instruction teacher teaches the principles, and demonstrates or illustrates the trade applications.	82.00	45.45
28. Related-instruction teachers specialize in teaching only one subject.	72.30	54.00
29. Textbooks in related instruction fit the curriculum needs better when written by school personnel.	63.00	82.31

Recommendations

This study was to determine the relative desirability of certain principles of related instruction and the extent to which those principles were followed in practice; hence, no attempt was made to ascertain the reasons why the principles were or were not followed. It is suggested, therefore, that vocational personnel study the reasons why practice lagged so far behind theory in certain principles.

Further study is suggested on the matter of shop and class scheduling, for no marked agreement was reached regarding the desirability of scheduling on the morning and afternoon plan, the week-about plan, or the two-week-about plan. Additional research could be directed toward the type of authorship of related-instruction textbooks, for apparently more use could be made of industrial representatives who would work in concert with school personnel when writing textbooks and instructional materials.

Other principles of related instruction which appear to need further study would be: to determine the desirability of the value of specialization by related instructors in teaching one subject, as for example, related science or related mathematics; the matter of the size of teaching load for shop teachers; and the value of study guides as a teaching method in related instruction.

That industry should be consulted more is indicated by the high degree of desirability and the low degree of practice as expressed by the jury members in a number of the principles. It is suggested, therefore, that more use be made of industry advisory and craft committees when developing instructional materials.

It is suggested that vocational administrators, shop teachers, and related teachers consider the statement of guiding principles of related instruction as representative of the evaluation and extent of practice of a considerable group of vocational personnel, and that an examination of the statement would be valuable in the evaluation of current programs of related instruction.

Further use may be made of the guiding principles of related instruction by teacher educators, vocational administrators, and by State Education Department personnel for in-service training and for discussion purposes at professional meetings. It is suggested that vocational personnel study the detailed findings and conclusions of the study for the possible improvement of current vocational programs.

Further research could be considered to determine to what extent the principles suggested as highly desirable are productive of success in related instruction. It might also be valuable to ascertain any additional principles of related instruction which appear to be on the frontier, in so far as they affect the achievement of high correlation between related instruction and shop instruction.

Air Education at Broadwater

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The Air Age Education program sponsored by the State Board of Education and the Montana Aeronautics Commission is not new to Broadwater County High School at Townsend, Mont. Aeronautics has been part of our curriculum for junior and senior students since 1944. The course was started as a preinduction course for students who intended to enter the air force. It was continued after the war because of the high level of interest in aviation caused by the postwar boom in flying. It is still taught, not only because the present war places renewed emphasis on aviation but because the school administration believes in the future of flying and the air age in which we and our children live.

Aeronautics, as taught at Broadwater High, takes in all phases of aviation: airplane structure, human factors in flight, aerodynamics, aircraft engines, meteorology, communications, navigation, C.A.A. rules, and history of aviation. While no phase can be covered completely, the student gains a basic knowledge of each. If he decides his future lies in aviation, whether as pilot, mechanic, weatherman, control tower man, or in any other of its many branches, he has the groundwork for a good start. Job opportunities in the field are discussed as a basic part of the orientation of the student in aviation.

We have two class and three laboratory periods a week. Class periods are spent in study and discussion of the phase of aviation which we are studying at the particular time. Construction of model airplanes takes up laboratory time. We start with the simplest gliders and rubber band powered models gradually working up to models of 6 ft. wing span powered with ¼ h.p. motors. These models are flown from the local airport which is close to town.

Field trips are part of the course. There are two or three during the school year. A trip is first made to the local airport where students have a chance to go for a ride with safe, competent pilots if they care to. The pilots explain movements of the controls and build confidence in the students. Often a student gets his first ride during this visit.

A second trip is made to the Helena weather bureau and control tower where the men in charge explain all phases of weather forecasting and tower operation.

The final and long planned for and awaited trip is to the East Base at Great Falls as guests of the United States Air Force. The students pay for this trip themselves. At the beginning of the school year they form a club. Twenty-five cents a week dues adds up to the price of a ticket on a Western Airlines DC-3 from Helena to Great Falls by the time of the trip which is in May. The students travel by car to Helena where they board the airplane for Great Falls. The trip is made with permission and co-operation of the parents.

On landing at Gore Field, the students are met by a bus and transported to East Base for a tour of the installation where they see how the air force operates. The

Aeronautics class with some of the models
— Photo by E. V. Reyner

Plane chartered for trip to Great Falls Airbase. Mr. Heberle at extreme right
— Western Airlines Photo

air force then returns them to Gore Field by bus for a night flight on Western Airlines back to Helena. The boys return to Townsend convinced that they have seen and learned much.

Plans for next year's course are even better. The class now has an aircraft engine and propeller which they intend to mount on a test stand for engine run-up and tests and mechanical experience including trouble shooting. We also have a complete light plane which will give experience in taxiing, aircraft structure, and other phases of ground operation.

We try, at Townsend, to give the student enough information to pass the written examination for a private pilot's license. Actual flight training is left to flying schools.

A Junior Aeronautics Club stimulates interest among younger students and model construction helps them to absorb many of the fundamentals of flight as an aid in preparation for the aeronautics course. At the same time these club members immensely enjoy club activities.

The teaching of aeronautics and direction of the Aeronautics Club is in the capable hands of Lloyd Heberle who is a private pilot who has been flying since 1937. Mr. Heberle is also vocational education instructor at Broadwater County High School.

Safety and Education

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In safety education, as in any phase or facet of the school program, we must accept the child as we find him and then proceed to take him as far as possible in all socially accepted actions known to be for the good of the individual and community.

To list some of these briefly, we might say:

a) To assist in developing him as a good citizen now and in the future.
b) To assist in developing the potentialities of each child to the fullest.
c) To assist the child in preparation for earning a living.
d) To assist him in becoming mentally and physically well adjusted.
e) To assist him in providing and properly using leisure time.

The late Albert W. Whitney, dean of safety philosophers, said: "*Safety first* is an appropriate sentiment in the railroad field, for safety on trains is more desirable than speed, barbers, stock reports, or a ladies' maid. . . . But to go into the schools with the slogan 'Safety First' which, if it is taken literally and seriously, means that safety is to be counted as the prime desideratum in life, is not only to be egregiously contrary to the facts of human nature but positively immoral."

One of the best definitions of "safety education" is used by the American Association of Teachers Colleges, N.S.C., "*Safety Education* . . . is defined as the area of experience through which boys and girls learn to make wise choices when the possibility of injury to self or others is one of the factors involved. 'Wise' choice does not necessarily connote avoidance of the possibilities of injury, but does connote conscious consideration of the safety factor involved."

Safety as a Part of General Education

Safety is a part of general education, not apart from it. In organizing or conducting a safety program we must be careful that we do not introduce a "new" subject, but put safety instruction and practice on the basis of general education to be lived rather than studied. Nothing in safety should work against the general objectives of a school system. We must practice what we preach, and if a program of safety education does not fit in with the philosophy of the "school" it would be better not to have it, but to reorganize our concepts to fit in with the philosophy and thereby foster a going concern.

The area of safety is a good one to help achieve the objectives contained in the philosophy of our general education program. By having children experience concepts of safety instead of learning rules about safety, we find that areas such as the social sciences, pure sciences, arts, and recreational areas, when used as a vehicle for safety work, accomplish many of the general aims of our schools.

As the home and the community are equally responsible for the education of the child, so are they equally responsible for providing safe living conditions and training in safety in their respective segments of society. Lip service does not give lasting results. It is participation that counts. Social problems, such as crime, housing, unemployment, and many others, obviously cannot be handled by children, but the problems of safety can. Then why not allow our social science classes to dig their teeth into this problem? At this point, mention is usually made of school patrols, but before one is organized we must weigh the value of training a few children to be responsible for the conduct of many, against training all the children in the responsibility of caring for themselves.

Safety as a Way of Living and Working

Safety is not a theory, but a way of living and working. To be pessimistic, a way of not living and not working, if ignored; for one out of every three deaths of children 5 to 14 years of age is caused by an accident. In the past 16 years, nonaccidental deaths of children 1 to 14 years decreased 67 per cent, while the total number of accidental deaths decreased only 23 per

cent. Since 1932, when safety education became a national concern, accidents of 5- to 14-year-olds decreased 32 per cent. This clearly indicates that there is a great possibility of cutting down the number of deaths by accident.

Any going concern stays a going concern as long as it is subjected to a critical evaluation from time to time. The safety of children and their safety program is no exception. The building and equipment should be evaluated by experts and school people. The accident reporting system and records should not only be evaluated but used as a basis for the safety program to follow, and the instructional part of the program should be evaluated to see whether it is still fulfilling the needs of the students and the community. Throughout all of this, we must remember we cannot give "rewards" for accident reduction or we lose the accuracy of our records. No accidents should be reward enough for safe living and working.

Teaching Electricity

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It has been generally conceded that electricity is one of the *least* taught subjects in the industrial arts. There are other neglected areas but few dealing with a product as universal in nature as electricity. It is difficult to imagine any citizen of the United States not having daily contact with this form of energy.

Regionally speaking, special subject areas should receive their due emphasis. Textiles in the East, jewelry and ceramics in the Southwest, and metals in the Midwest are some examples. From a national viewpoint there probably is no commodity with as great an influence upon our way of life as electricity. Textiles, yes, are more fundamental and universal. But has there been a general acceptance of this subject in our program? Are textiles regarded as a *unit* in crafts? A clarification should be in order but the question cannot be debated here.

If the thesis that electricity is the least taught of all major subjects in the industrial arts is accepted, a question follows: *Why* is it the least taught? There are many reasons but those most paramount seem to be:

1. Lack of adequate knowledge by the teacher.
2. Lack of training in colleges for teacher education.
3. Lack of readable, basic texts.

The first two reasons given are interwoven to a large degree. We cannot always blame an instructor if the student doesn't learn. There is a slogan: "If the student hasn't learned, the teacher hasn't taught." It could be agreed that the motto is correct. The student, no doubt, will always learn when good teaching is being done, but in some cases the learning is in a negative direction. Generally, such a student will eliminate himself before graduation. In some isolated instances, however, he can lose his identity in the academic procession until the coveted diploma is procured. Is this the fault of the individual or the institution? The point is subject to review. The basic fact remains that an anemia of subject matter and teaching inefficiency may exist at all levels in our educational system.

The third reason listed should not be construed as a criticism of authors or publishers. It is just a fact stemming from our own confusion as to the quantity of electrical subject matter which should be taught. Look at almost any text on electricity. The chapter headings in themselves are frightening to the uninitiated. Attempt to read a few paragraphs, if you will. Soon an accumulation of technical words and terms and esoteric rules and laws will lead one into a maze of verbiage which defies extrication except by the technique of laying the book aside. In almost all cases, electrical texts have been written on the engineering or vocational levels. They can serve our purposes as supplementary material but certainly should not be given to industrial-arts students for self-study. Nothing will kill an initial interest or motivation as quickly.

Criticism of the *status quo* is relatively simple. After four years of method and content experimentation with college students, visitation of school shops, and discussions with teachers of electricity, the conclusion has been reached that there is a definite lack of *self*-criticism, and that criticism directed toward the status quo is rampant. Seemingly we are blindly following the techniques of former teachers or the dictates of invalid books.

It is the writer's belief that to learn a few principles well is educationally more sound than to temporarily memorize many facts. The latter will be forgotten quickly with the acquisition of a term grade. With this philosophy in mind, the paragraphs following will be concerned with a suggested outline of the *fundamentals* of electricity. Although some emphases and supplementary materials may differ, the main units could well serve the objectives of *beginning* industrial-arts electricity. It has been found, through actual classroom experimentation, that the continuity herein presented is the most efficacious from the ninth grade through the college years. No doubt the teacher will wish to make changes depending upon his situation and type of student. In the light of the phil-

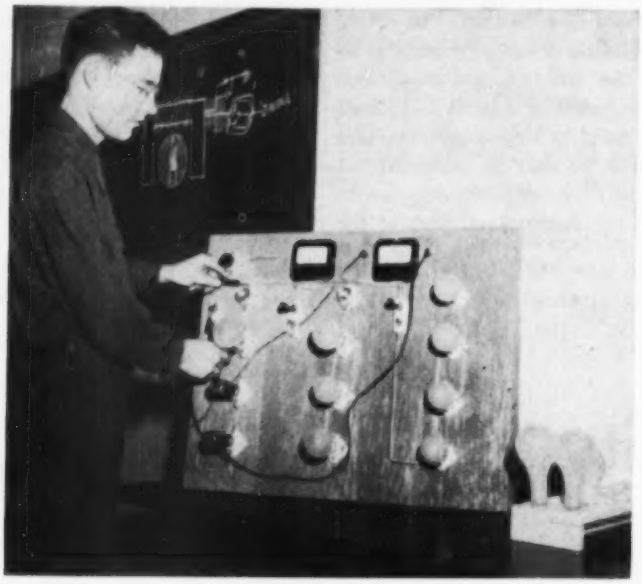


Fig. 1

osophy and criticism expressed earlier, it is hoped sincerely that he will.

Knowing Units

I. *How Electricity Is Used*
- A. *Useful Effects* (Through lecture, demonstration, and discussion, give examples of each. See description of teaching aids which follow.)
  1. Power
  2. Heat
  3. Light
  4. Electromagnetism
  5. Communication
- B. *Harmful Effects*
  1. Sparks
  2. Short circuits
  3. Magnetizing of watches, compasses, etc., and radio interference
  4. Shock
- C. *Safety With Electricity* (Stress this unit at all times.)

II. *What Is Electricity?*
- A. *Electrical Current*
  1. Electron flow
  2. Amperes
  3. A.C. and D.C.
- B. *Voltage*
  1. Electrical pressure
  2. Volts
- C. *Resistance*
  1. Conductors
  2. Insulators
  3. Ohms and Mhos
- D. *Relationship between Amperes, Volts, and Ohms.*
  1. Ohm's Law (Emphasis is not necessary at the lower levels.)

III. *How Electricity Works*
- A. *Circuits*
  1. Series
  2. Parallel
  3. Series-parallel
  4. Two-point control
  5. Three-point control
  6. Three wire return-call system
- B. *Switches*
  1. Demonstrate the different types and explain their functions. This can be done concomitantly with III, A.
- C. *Fuses*
  1. See III, B-1.

IV. *How Electricity Is Made*
- A. *Magnetism*
- B. *Principle of Generators*
  1. Mechanical manufacture
- C. *Dry Cells and Batteries*
  1. Chemical manufacture
- D. *Friction*
  1. Static electricity
- E. *Principle of Motors*

V. *How Electricity Is Measured*
- A. *Voltmeters*
- B. *Ammeters*
- C. *Galvonometers*
- D. *Ohmmeters*
- E. *Wattmeters*
  1. Watt formula (Emphasis is not necessary at the lower levels.)

Doing Units

Only a few of the possible doing units are here given. The amount of laboratory work will depend upon: (*a*) the time allotted administratively, (*b*) the educational level, (*c*) the ability of the student.

I. *Splices* (The teacher should demonstrate and acquaint the student with the more modern techniques of splicing.)
- A. *Make, solder, and tape the following splices:*
  1. T tap
  2. Rattail
  3. Western Union

II. *Circuits*
- A. *Diagram and construct the following circuits:*
  1. Series circuit
  2. Parallel circuit
  3. Series-parallel circuit
  4. Two-point control
  5. Three-point control
  6. Three wire return-call system

III. *Projects*
- A. The projects listed have proved to be the most popular in our classes. Working drawings of these may be found in electrical project texts.
  1. Simple motor
  2. Wiener roaster
  3. Crystal set
  4. Tesla coil
  5. Electroplating set
  6. Transformer
  7. Buzzer
  8. Telegraph system
  9. Electromagnets
  10. Photo timer
  11. Extension cord

IV. *Repair*
- A. From the standpoint of consumer education and home citizenship, each student should be asked to repair at least one home appliance. At times this technique is not possible because of a dearth of materials. If this is the case, the instructor can demonstrate upon several types, such as a toaster, flat iron, hot plate, and the like.

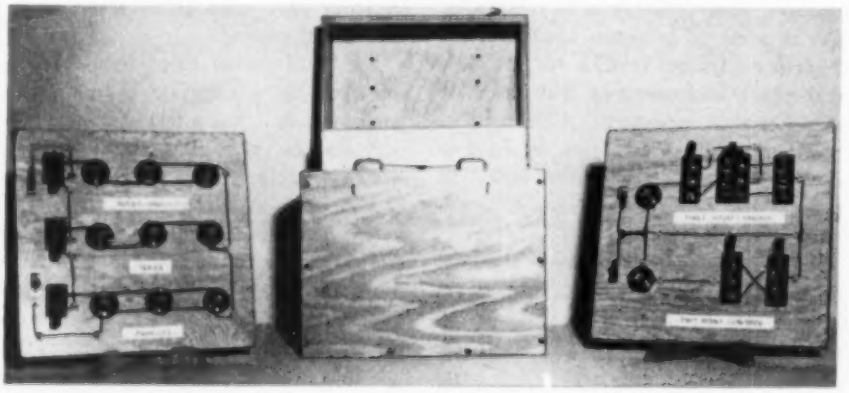


Fig. 2

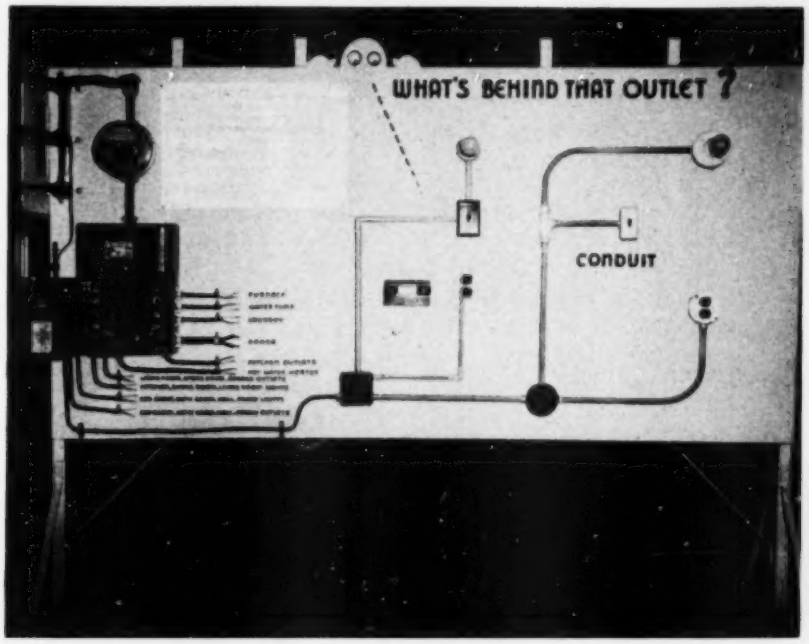


Fig. 3

Teaching Aids

One of the most frustrating experiences in teaching electricity is that of attempting to explain circuits and their laws by the use of only a blackboard. One of the most valuable aids to instruction in teaching such a unit is shown in Figure 1. This demonstration panel consists of a series, parallel, and series-parallel circuit. Through the use of knife switches, the circuits may be closed independently or together for the purpose of comparison. Through the use of the voltmeter and ammeter, voltage drops, current flow, and resistances are readily demonstrated.

Since many of the writer's students are intent upon a teaching career in the industrial arts, the demonstration panel just mentioned has proved to be a powerful motivation in the laboratory. Many different types of panels have been constructed by the students for their own use on the job. Improvements are being made continuously. The most recent refinement consists of three panels upon which the six typical circuits are mounted. See Figure 2. A case has been made in which all three panels can be carried. There is also room for two dry cells, clip wires, and the panel stands. The over-all dimensions in the carrying case shown are 14 in. high by 13 in. wide by 8 in. deep. Portable, lightweight, and compact, it should prove a valuable addition to the tool kit of any teacher. It is not to be inferred that the acme of perfection has been reached. There are many modifications that can be made such as larger panels for better visibility and a provision for measuring instruments. Any changes should depend upon the local situation.

Another valuable visual aid is shown in Figures 3 and 4. This device assists in answering questions readily concerning house wiring. Students can be *shown* as well as told. A lettered card attached to the front of this testing device should explain the function of the panel and the various ways in which it can be set up for problem situations.

Working drawings, of these instructional aids, have been omitted intentionally. The sizes of the panels and the number of circuits and devices they contain will depend upon the materials obtainable, the class sizes, and the amount of accessible floor space.

It is sincerely believed that a fundamental knowledge of practical electricity may be taught by the wise use of the teaching units and aids described. This is not merely paying *lip service* to an important and integral part of industrial-arts education. Because of almost four years of experimentation, it is hoped that at least a *slightly* above average course-content and presentation technique has been gained. The end of the journey is not in sight and it never will be. Experimentation should and must continue if we are to keep pace with our constantly changing industrial world.

Acknowledgments

Grateful acknowledgment is given to the following men for their contributions to this presentation:

Chester L. Addington, student — construction and design of the electrical panel kit.

Carl Richards, instructor of woods for construction of the house wiring panel.

Bernard Josif, instructor of graphic arts — photographs of teaching aids.

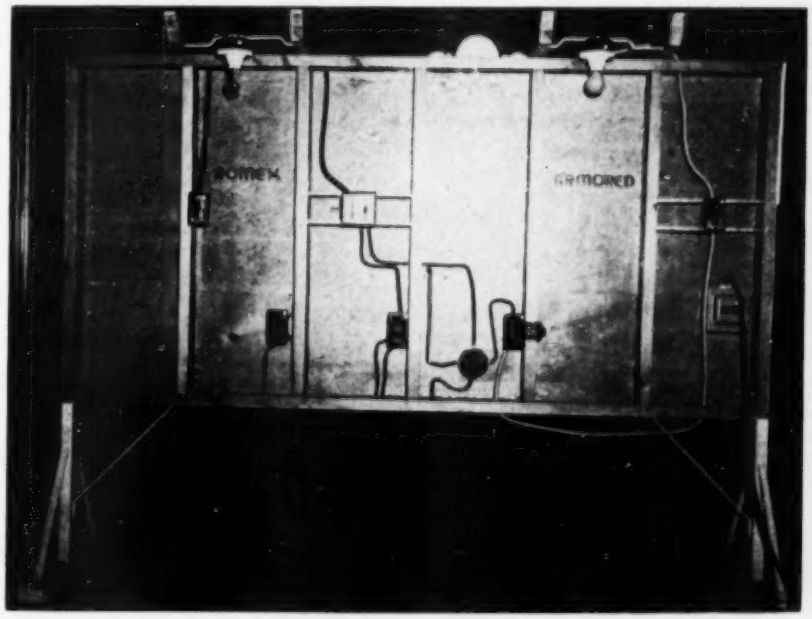


Fig. 4

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

JOHN J. METZ, Editor

MORE SHOP TEACHERS ARE NEEDED

Now that we have just entered the 1953–54 school year, it might be well to spend a few moments in silent contemplation of what we might attempt to do for our students during the coming school year besides teaching them the fundamental bits of knowledge about the materials, skills, and tools to which we will introduce them.

We are teachers, we know what it means to prepare one's self as a teacher, and we know what personality traits a good teacher should have. We also know that many more new shop teachers are needed — can we do something to supply this need?

Among the brighter students, there may be a few who have what it takes of leadership, enthusiasm, willingness to work with others, patience, and altruism to make a good teacher. Why not cultivate these youngsters and try to interest them in taking up teaching industrial arts or vocational education as a career? While we are considering this question, it is well also to remember, that we as teachers must set these few chosen members of your class, an example of what a good teacher must be, and how he must deport himself in and out of school.

The June 1, 1953, issue of "Shop News" published by the Vocational and Practical Arts Office, Curriculum Division of the Los Angeles City Schools, carried an article titled "New Techniques in Teacher Recruitment," which explains the new form of teacher recruitment which the Alpha Field Chapter of Epsilon Pi Tau has introduced.

The members of this National Industrial Education Honor Fraternity held a dinner to which each of the men brought a boy chosen from his own school shop. After a sumptuous meal, members of the industrial education division addressed the group on such subjects as "The Importance of Industrial Arts in the Curriculum," "The Satisfaction and Rewards Accruing to One Who Has Spent His Life in Teaching," and "The Requirements and Opportunities for Those Interested in the Industrial Education Teaching Field."

Then a discussion was held on "The Nature of the Program and of the Opportunities for High School Graduates to Prepare Themselves for Teaching Industrial Arts and Vocational Education."

This was followed by a color motion picture of the 1952 Olympic Games.

So well was this program received, it was decided to make it an annual event.

The entire effort seems to be worth while that other teacher groups might well give it a trial in order to get more recruits who want to teach in the fields of industrial arts and vocational education.

THE A.V.A. CONVENTION

It may be well to remember that the A.V.A. convention will be held at an earlier date than heretofore. Be sure to jot down the dates, November 23 to 27, and be doubly sure to attend if it is at all possible for you to do it. As you no doubt know, the Conrad Hilton Hotel at Chicago is the headquarters, and you should make your reservation at once.

Attendance at this convention is more necessary now than ever. There are forces at work to make it more difficult for vocational education to continue to work and go forward as heretofore. The effort to cut down the vocational aid was a clear indication of this. Fortunately, this effort was circumvented.

Vocational education is extremely necessary in this country. If we fail to train mechanics to keep up our position as foremost producers of what is needed to defend our country and to maintain the standard of living to which our people are accustomed, we will be shortly outrun by the countries we have so freely equipped with money and machinery, so they could establish themselves as our competitors in industry and commerce.

Our former ally, now our greatest enemy — the Russians with their communist Chinese henchmen — made it quite plain that the best way to win dominance over our country was to help it spend itself into bankruptcy. Using their old system of creating dissension among races, peoples, and nations, they have succeeded in producing ill will between us and the other peoples of America, and between America and England, France, and other European and Asiatic nations.

We must be prepared to protect ourselves at a moment's notice and for that reason have the best prepared mechanics. We must let nothing interfere with the means of training those mechanics — vocational education.

Be at Chicago when the A.V.A. meets there November 23 to 27.

AN UNSOLVED PROBLEM

We are asked repeatedly—"Why don't you print all projects on one side of the paper only, so that we can clip them for filing without cutting up another project or article which should also be filed."

The cost of paper and printing are both high as anyone who has anything to do with publishing well knows. If only one half of the available white space on the paper is used, the other side serves no good purpose. Many readers would complain bitterly if that were done.

One reader suggested that he would be willing to pay 50 cents more to have the number of pages doubled. At the present cost of the paper used in INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, the subscription price would have to be raised one dollar just to take care of the increased number of pages. This would not take care of the increase in the cost of the postage which Uncle Sam would demand because of the added weight.

Other readers have suggested that the reading matter, and the problem and projects section be backed up by advertising. What a howl that would raise from the advertiser. He is really the one who makes it possible to publish a magazine of the kind we offer our readers. He wants his advertisement to work for him for more than just a day or two. Cutting up the announcement for which he paid, and filing it away in different envelopes or folders would defeat the purpose for which he bought it.

Of course, and I am making this suggestion with a grin on my face, and my tongue in my cheek, each reader could subscribe for two copies. Then he could cut it up to his heart's content.

Really, I wish I knew a solution but, unfortunately, I don't. Therefore, kindly make the best of it as thousands of other readers have done during the past thirty-nine and one-half years that INDUSTRIAL ARTS AND VOCATIONAL EDUCATION has been published.

PROBLEMS AND PROJECTS

LAMP—FROM A BOWLING PIN

EDWARD BARSKI
Industrial Arts Instructor
Public Schools
Stillwater, Minn.

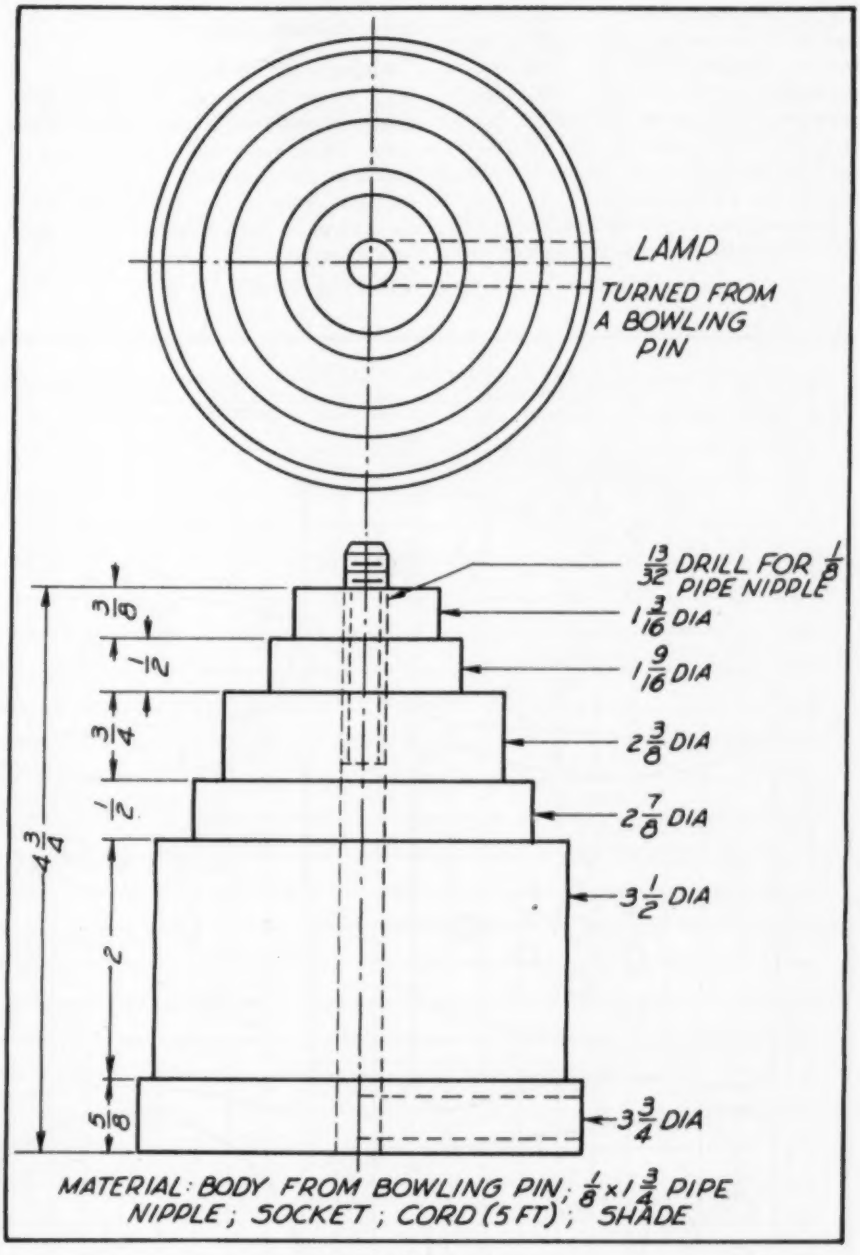
This lamp is made from a discarded bowling pin, which the boy can get at the local bowling alleys.

It finds its value from the fact that it not only makes a neat, useful project for the home, but also that it helps to teach wood-turning fundamentals, the use of lathe tools, and the principles of proper lathe operation.

The finish used on the lamp is optional with the student or instructor, although a mixture of shellac and oil (French polish) put on while the project is still on the lathe has proved very satisfactory in bringing out the natural beauty of the maple grain.

The socket, pipe nipple, cord, plug, bulb, and shade can be purchased at the local hardware store or electrical shop, and the boy will get a great deal of personal satisfaction in wiring the lamp for proper operation.

Electric lamp with bowling pin base



Detail of lamp base

STUDENTS AT CHELSEA VOCATIONAL HIGH SCHOOL MAKE PLASTIC LAMPS FOR THE RED CROSS

Edwin Phillips and the students of the Chelsea Vocational High School in New York City, were asked by the Red Cross to produce fifty Dektufts lamps for veterans' hospitals. The Red Cross paid for the materials and the students promptly swung into action.

Mr. Phillips set up a job on a mass production basis. The students constructed the cores and the bases of the lamps to which the tufted plastic (Dektufts) squares were attached by a simple nailing operation.

The fifty lamps were completed in record time. The Red Cross was not only delighted, but astounded with the superior work done

by the Chelsea students who were supposedly slow learners.

Up to the present about 200 of these lamps have been constructed from Dektufts by this class at Chelsea Vocational High School.

Now Mr. Phillips keeps a complete inventory of not less than 200 molded plastic Dektufts on hand at all times, plus all the component parts for his lamps. The students constantly produce them for their own homes or to sell. In two years no other project has created more interest in the Chelsea Vocational High School Plastics Shop.

Increased interest in the imaginative uses for Dektufts has prompted the class to begin

(Continued on page 285)

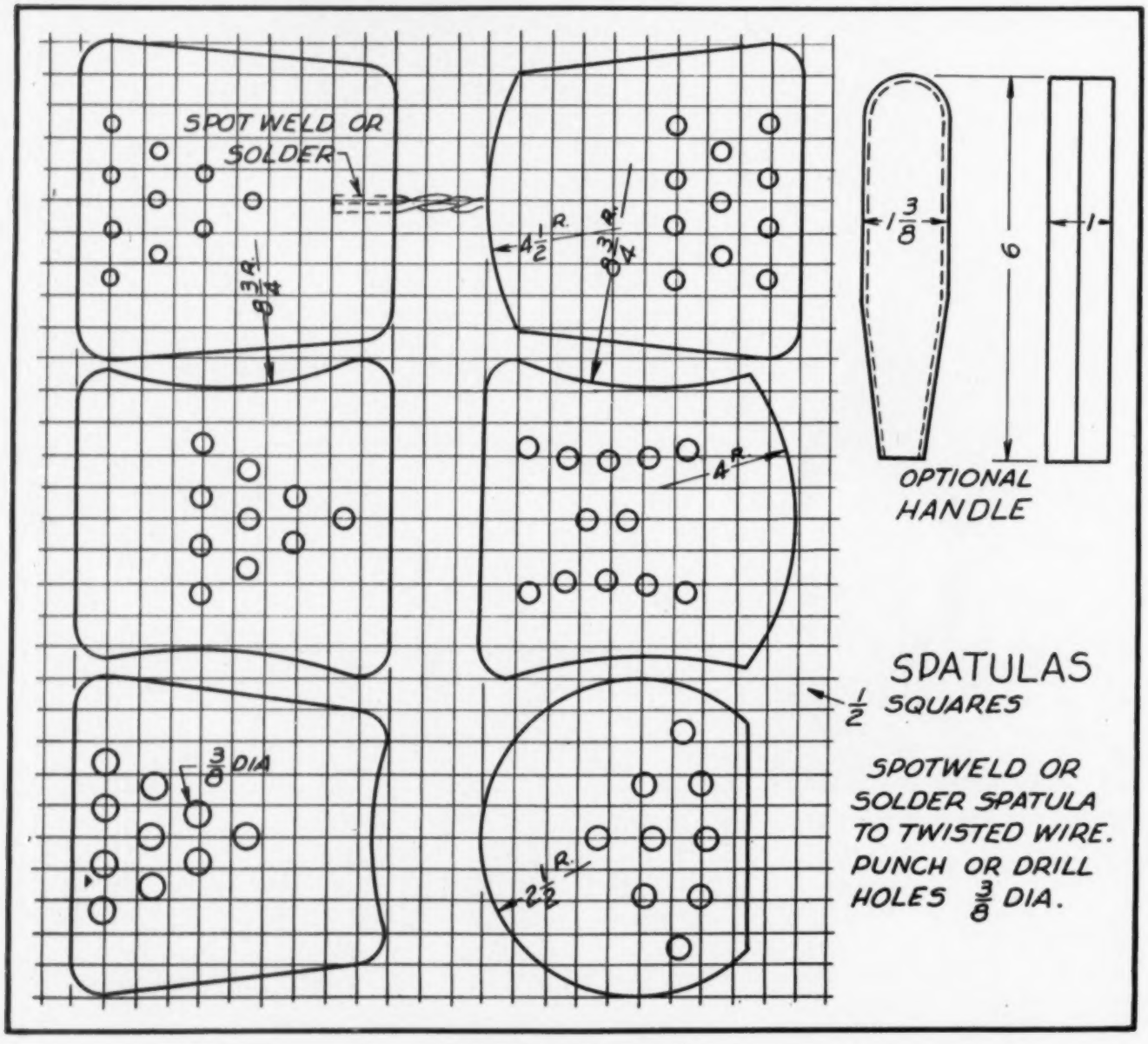
A BARBECUE SET

LOUIE S. TAYLOR
Department of Industrial Arts
University of California
Santa Barbara, Calif.

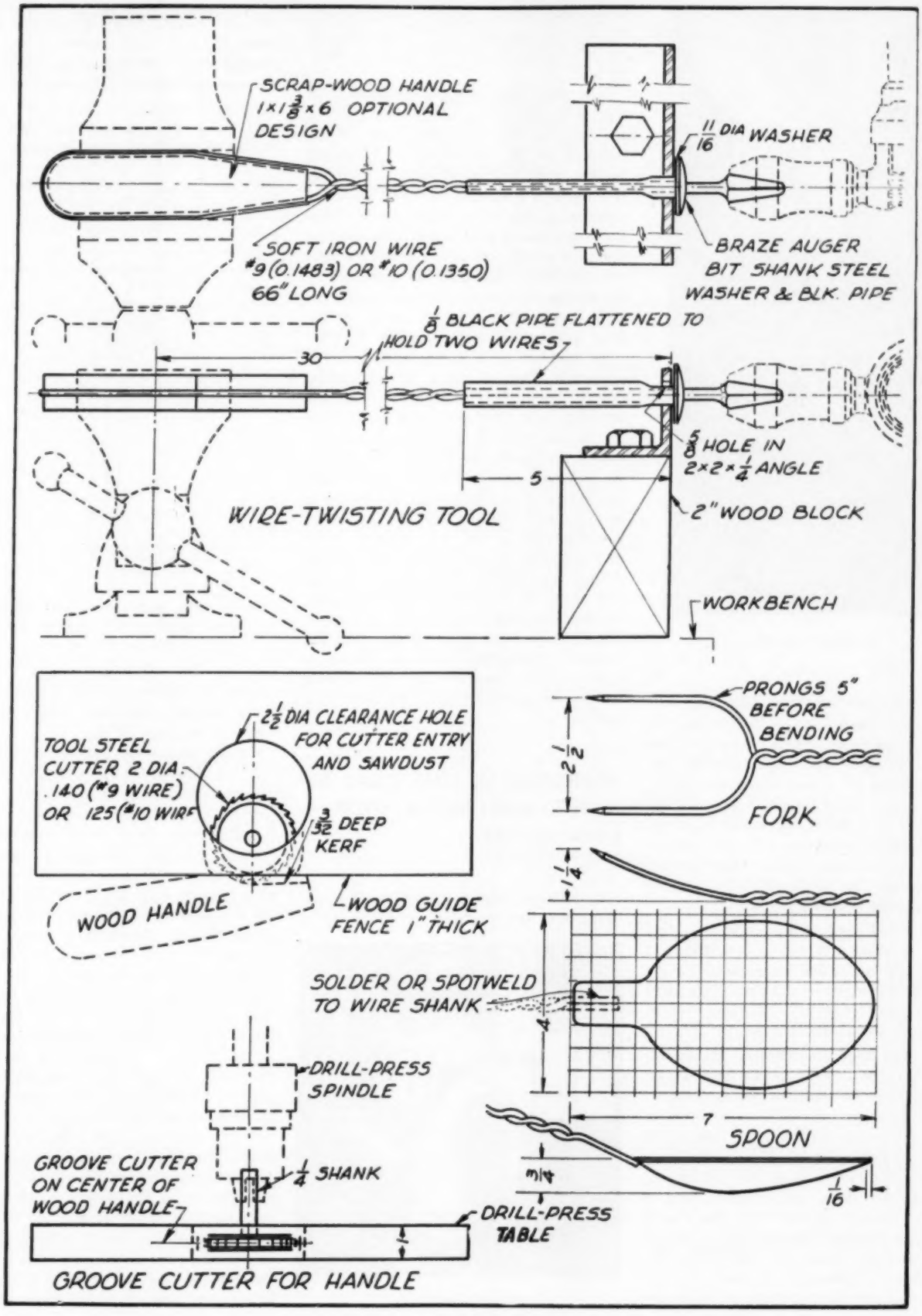
Here is a project that will quicken the interest of the boy as well as provide something very useful and pleasing for him to take home. There are several learning units included in the construction of this barbecue set and it should prove to be a suitable project for most metal shop situations. The complete set consists of a fork, a spoon, and a spatula or turner. They can be made from inexpensive materials and frequently scrap or waste materials can be used. It is not necessary to make all three pieces but if time and materials permit the boy will enjoy making them and any parent will appreciate having a complete set.

The shanks for the three pieces are made from number 9 or number 10 soft black iron wire. The wire is formed around the wooden handle and twisted to stiffen it and at the same time secure the handle in place. An examination of the accompanying drawings will serve to acquaint you with the details.

Before beginning the set it will be necessary to construct three pieces of special equipment. They are very simple, however, and any metal



Various designs for spatulas



Details of parts of barbecue set

Barbecue set

shop teacher will be able to make them in a short time. Number one is the twisting tool shown in the drawing. It is made by cutting a piece of ⅛-in. black pipe, 5 inches long and flattening it so that two wires will fit into it side by side. Fit a square piece of stock into one end so that it can be held in a brace for turning the twisting tool. An old auger bit will be fine for this. Slip a washer between the pipe and the shank and braze or weld them together as shown.

The second piece of equipment is a short length of angle iron with a hole drilled in one end. Make the hole large enough for the twisting tool to enter and turn. This angle iron is then fastened to the bench about 29 in. from and level with a vise.

The third piece of equipment is the slotting saw. This is used to cut the slot in the handle for the wire. To construct the saw, take a piece of tool steel 5/16 in. thick and 1½ to 2 in. in diameter. Drill a ¼-in. hole in the center and weld in a piece of ¼-in. steel stock 3 in. long to form a shank that will fit into the drill press chuck. Chuck up this piece of stock in the lathe and face both sides true to the shank. Undercut the two faces a little so that the edge is thicker than the middle. The edge should be about 5/32 in. thick when the saw is finished. Remove from the lathe and file in about 30 teeth. Be sure to keep in mind the direction that the saw will turn. The saw can now be heat-treated and it will be ready for use.

After these three pieces of equipment have been made the hardest part is over and you are ready to begin the construction of the barbecue set. The first step is to cut the handles from any wood that is available. Hardwood is preferable but not absolutely essential, as any strong wood will do. Seven ply veneer can be used as well, provided that it is thick enough and the grain runs the right direction. When the pieces are ready, set up the slotting saw and saw a groove around the entire length of each handle except for the short space at the small end where the wires come together. Next cut a length of wire sufficiently long to make several shanks. Stretch it while it is in one piece to remove the kinks. Cut now into pieces 66 in. long for the individual shanks. Wrap these pieces around the handles so that the two ends of the wire meet with the handle in the center of the loop. Clamp the handle in the vise to hold the wire in place and twist up tightly with the twisting tool. The material at the ends that was in the twisting tool and did not get twisted is to be shaped to make the fork or cut off if a spoon or spatula is made. Patterns are shown for the spoon and spatulas. These can be made from stainless steel and formed as shown. The shanks are soldered or spot welded in place and with a little cleaning up you will have a very useful and ornamental barbecue set.

PUNCHING A TIME CARD IN THE SHEET-METAL SHOP

SIDNEY HUCHITAL
New York City, N. Y.

In order to stimulate interest in the sheet-metal shop and incidentally simplify record keeping, the following system was developed at the Alexander Hamilton Vocational High School in Brooklyn, N. Y.

Sheet-metal shop

SHEETMETAL SHOP

Name ..... Off. Class .....

JOB	Grade	Service	Grade	Production	ATTENDANCE

Time card. Both front and reverse sides ruled alike. Original card 4¼ by 7½ in.

We secured a time clock and a time card rack and mounted both in a suitable place in the sheet-metal shop. We prepared a time card which would serve several purposes: as an attendance check, as a progress card showing jobs done and grade received (see card — job — grade), as an individual shop service record (see card — service — grade), and as a place to record work traits, breaches of discipline, etc. (production). Both sides of the card are used and one card covers the regular ten-week marking period.

Each new class is introduced to the time clock and time card at the first session, a lesson is given in how to punch in, and each column is carefully explained to the group. The cards are filled out, numbered to correspond with the work station number, and actual use of the card started.

At the beginning of the shop session, the teacher stands at the door near the time clock. As each boy enters, he takes his card from the rack, punches in, and drops it in a box alongside the clock. When the late bell rings, the clock is locked (key switch), unpunched cards are placed on the desk by the shop foreman, and punched cards are replaced in the rack. Late-comers must be signed in or they are

marked absent. Boys are docked, as in industry, for lateness and absence.

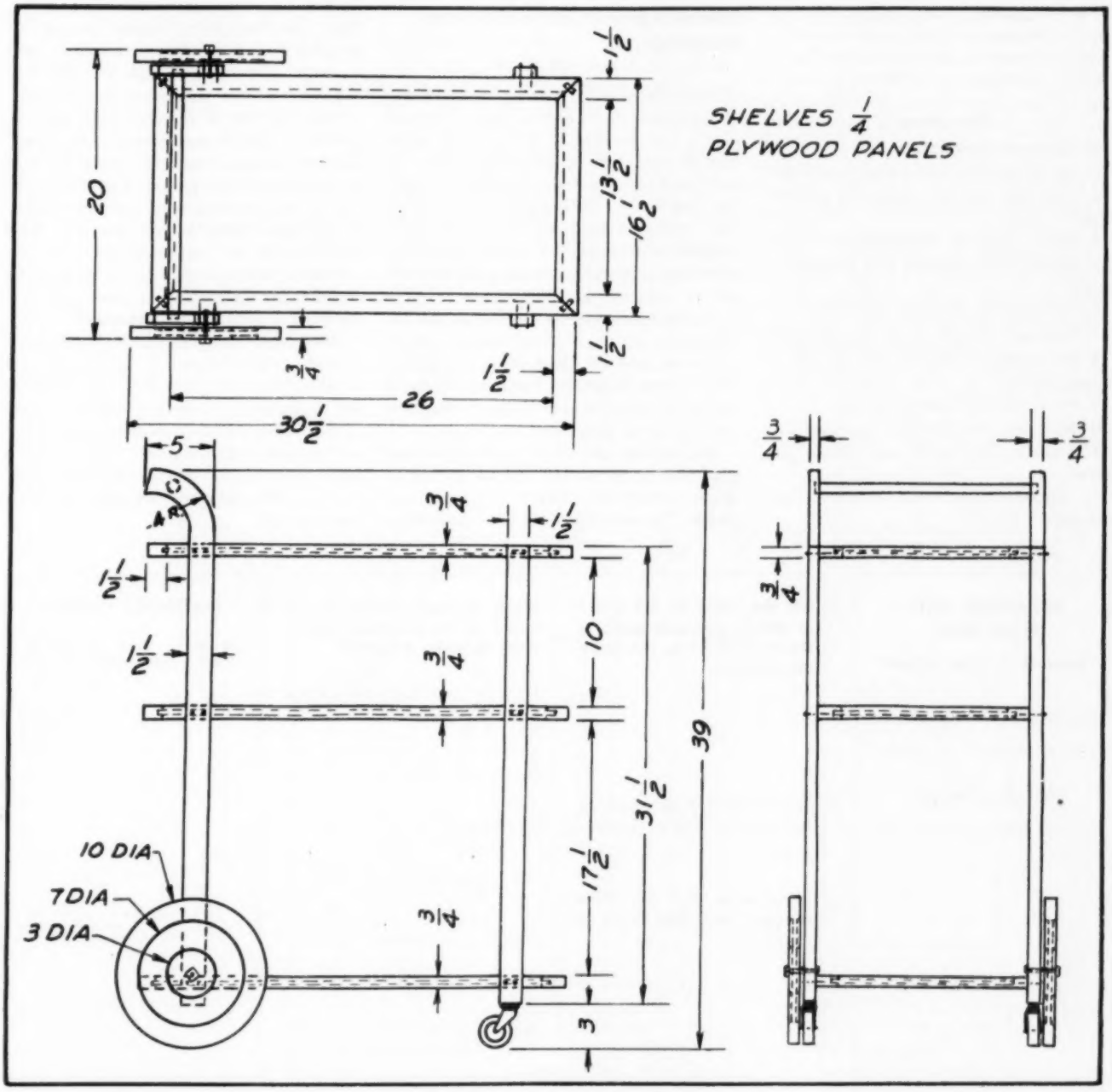
As each boy finishes his job he brings both the job and his card to the instructor, who enters the job and job grade on the card. Marks for service and production are entered in the same manner at the proper time, and in each case the boy returns the card to the rack.

This system has been found to work very well. The boys enjoy the experience, each boy has a personal progress card available at all times for discussion with the instructor, and also for the purpose of comparison with other boys in the class. Final marks can be calculated by each boy from grades listed on the card. For the instructor, marking can be more objective, the checking of attendance is simplified, and the bookkeeping is held to a minimum.

HOSTESS CART

DELL REED
Instructor of Industrial Arts
High School
Liberal, Kans.

The hostess cart described herewith was designed for both junior high and senior high school students. Many different variations may be applied in making this project. It has been



Details of hostess cart

successfully made by many eighth-grade students.

The cart may be made of walnut or mahogany.

BILL OF MATERIAL

No. of Pcs.	*Part*	*Size*
3	Shelves	¼ x 14 x 27-in. plywood
6	Shelf frames	¾ x 1½ x 29 in.
6	Shelf frames	¾ x 1½ x 16½ in.
2	Legs	¾ x 1½ x 32 in.
2	Legs	¾ x 1½ x 39 in.
1	Handle	¾ x ¾ x 17 in.
2	Wheels	¾ x 10 x 10 in.
2	Lag screws	¼ x 1½ in.
2	Washers	¼ in.
24	Screws	No. 9 x 1½ r.h.b.
2	Casters	2 in. high

Procedure

1. Cut plywood shelves to size.
2. Cut all shelf frames to length and width.
3. With dado head cut grooves for plywood in shelf frames.
4. Miter corners of shelf frames.
5. Dowel frames together with plywood inserted.
6. Cut front legs to length and width.
7. Mark and saw back legs to size and shape.
8. Cut handle to size and turn on lathe to proper shape.
9. Mark and drill holes for handle.
10. Mark legs and drill holes for screws.
11. Assemble legs, handle, and shelves with screws.
12. Cut wheels and turn on lathe to size and shape.
13. Drill holes for lag screws to attach large wheels.
14. Use lag screws and washers to assemble wheels to cart.
15. Drill holes for casters.
16. Apply casters to legs.
17. Sand and prepare cart for finishing.
18. Apply desired finish.

USE OF PLAN SHEETS

MERVYN T. JONES
Thomas J. Stewart Junior High School
Norristown, Pa.

Most shop instructors realize the advantages of using plan sheets in their classes. Because of the cost involved in having these sheets printed many schools are without them. A very good plan sheet can be made by using two stencils on a mimeograph machine which most schools have. Using the largest paper available in this case (13 by 8½) and using both sides of the paper, it can easily be made into an attractive plan sheet.

For the convenience of the teacher and the student we try to use three different colored papers for seventh, eighth, and ninth grades. This is very helpful in filing the sheets. A student is appointed in each class to distribute and collect the plan sheets.

The teachers can decide what information they want on the plan sheets, but it must be simple enough for students to understand readily. The writer does not allow students to get materials or tools until he has satisfactorily completed the plan sheet.

On the sheet shown here, we have it arranged so that the first page shows a drawing and dimensions of the object to be made. On the back page the bill of materials is shown. This arrangement makes it very easy for the teacher to see at a glance the object and the materials needed.

On the inside page we have the students list the steps in the order that they will be performed. Then they must explain where they got the idea for the projects. This helps in learning what books the students use and what type book they enjoy looking through for projects. It is of great assistance later when we order new books or when we submit to the library a list of suggestions for new books.

The next part of the plan sheet asks the student to list the new tools that were used, also what changes would he make if he were to remake the same project. The latter question is very important as it shows whether or not the student learned from the work experience he has just completed.

Finally, there is a space for the date started and the date completed and also a space for his grade or mark earned on the work.

When these plan sheets are first introduced to a class they of course do not like the idea of filling them out before beginning the work but gradually they learn it is helpful to them in their work and they are more than willing to co-operate. The students learn to write more clearly, and their spelling of the names of the tools and materials will also show improvement.

INDUSTRIAL ARTS PLAN SHEET

Stewart Jr. High School

Name..... Section.....

Name of Project..... Area.....

SKETCHES OF PROJECT

(Freehand Sketches and Dimensions)

Page 1

List the steps in the order in which you will perform them in making the project selected.

1. .....
2. .....
3. .....
4. .....
5. .....

Where did you get the idea for making this project?

What tools that are NEW to you, will you have to use?

1. .....
2. .....
3. .....
4. .....
5. .....

Page 2

What changes would you make in this project if you were to make it again?

1. .....
2. .....
3. .....
4. .....
5. .....

Date Begun .....

Date Completed .....

Grade..... Teacher .....

Page 3

MATERIALS NEEDED

No. of Pieces	Size, Gauge, etc.	Kind of Material

Page 4

Original plan sheet page is 6½ x 8½ in.

SUGAR-SCOOP CIGARETTE TRAY

LUDWIG JOHN KASAL
Bronxville, N. Y.

Social values, simplicity of construction, variety of experiences, low cost, and availability of material are five important factors in evaluating a project for shop use. The sugar scoop and cigarette holder rates high in terms of the above-mentioned criteria. It is well suited to production and useful as a Red Cross project. In addition it is a dual-purpose project for general shop, which co-ordinates drawing with metal shop.

Directions for Drawing

1. Measure the diameter of the can and draw a semicircle as a top view of the can with a compass.
2. Measure the height of the can and the width and draw the side view projecting it below the semicircle.
3. Divide the semicircle into the number of parts shown by combining the 45-deg. triangle and the 30–60 deg. triangle.
4. Lay out the center lines shown in the side view and swing the circular lines with a compass.
5. Draw a base line next to the side view and step off the distances of the parts in the semicircle — double the number of spaces. This is the length of the stretch-out for the pattern.
6. Project or bring down the lines from the semicircle and where they strike the edge of the scoop, project them over to the stretch-out. Number the sections. This will help to keep the intersecting points in order.

Directions for Fabrication

1. Heat one end of an evaporated milk can and remove the end.

CAUTION: Heat it only enough to melt the solder. Do not burn away the tin plate as this will mar the appearance of the scoop and make it difficult to solder.

2. Wrap the pattern around the can and fasten with Scotch tape.
3. Scribe a line to indicate section to be cut away.
4. Cut away the metal and save the scrap.
5. Lay out the lines for the feet and handle on the scrap as shown.
6. Bend the stock around a tubular object of appropriate diameter.
7. Solder all components together with a soldering copper and fifty-fifty solder.
8. Clean off excess solder with a scraper or knife.
9. Paint appropriate color.

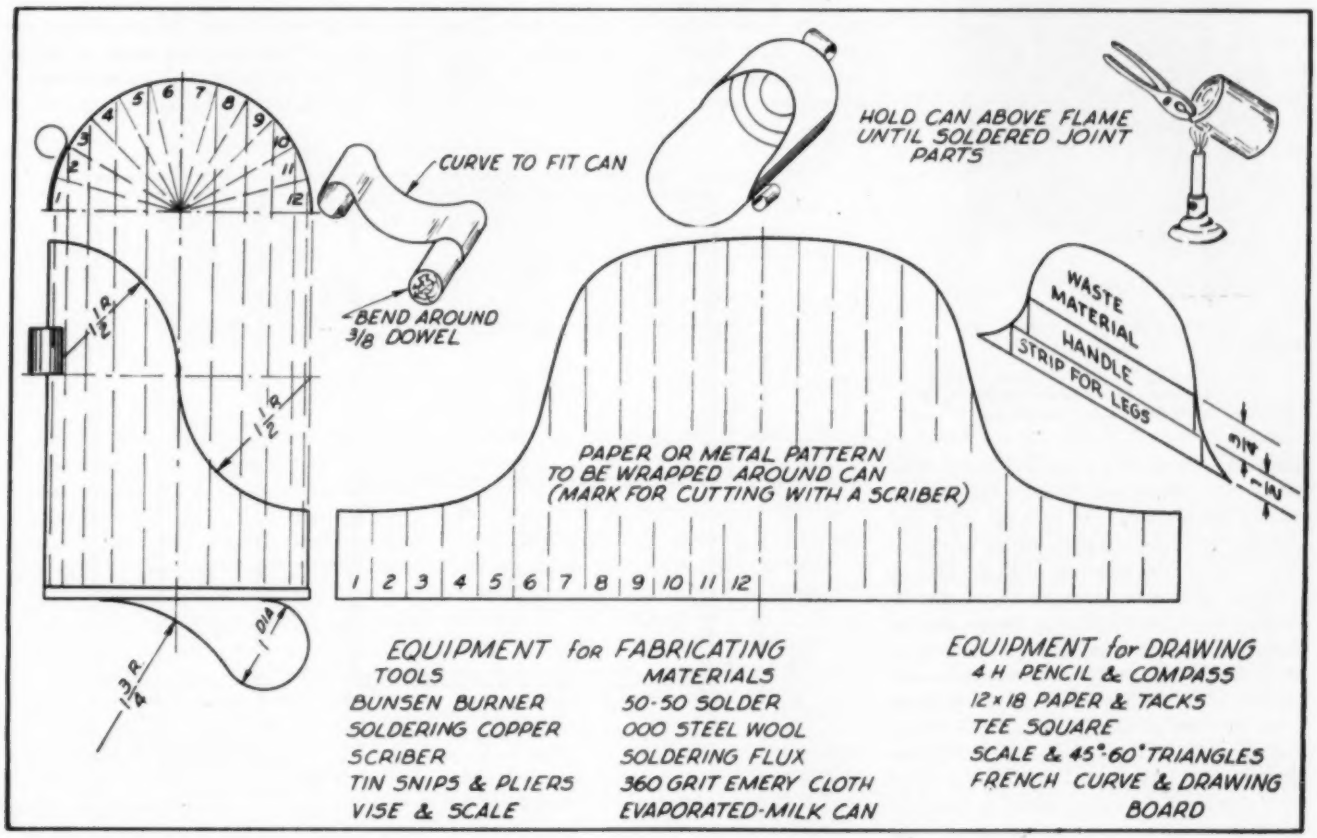
CHINA CABINET WITH SLIDING PLATE GLASS FRONT

F. J. CLARKE
Edmond, Okla.

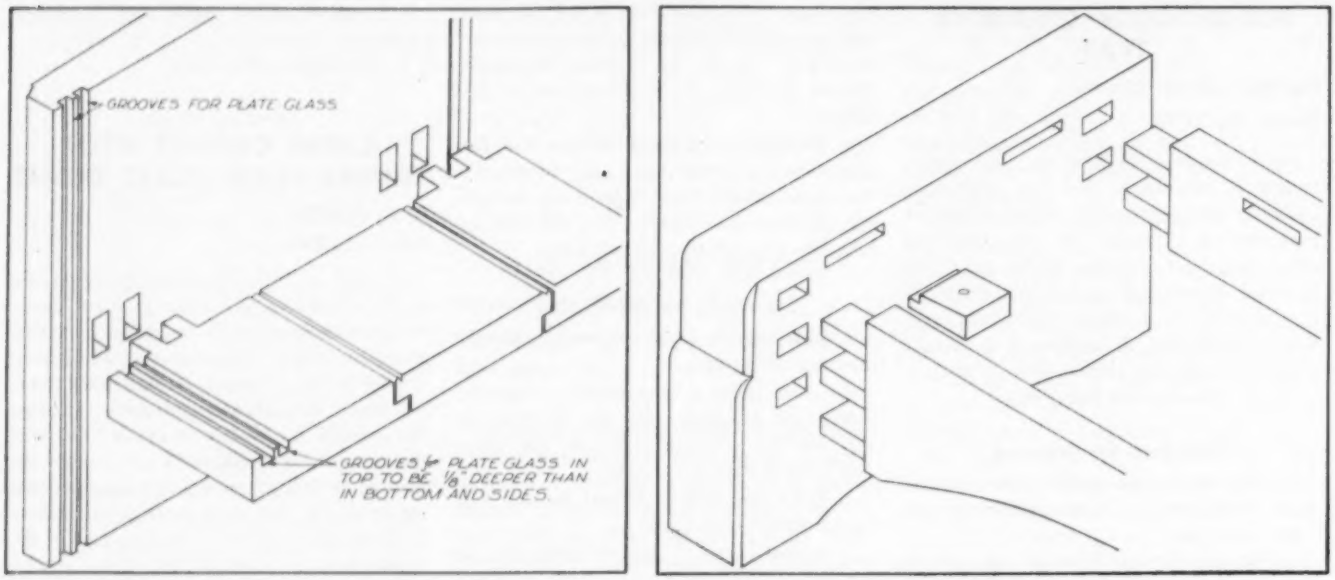
A piece of furniture designed specifically for the display of such things as silver, china, or sports trophies is often in demand by housewives and others. The essentials to be considered in the designing of such pieces are: (1) that it should have a glass front; (2) that the contents are readily accessible; (3) that the view of the contents be not unduly obstructed by door frames or other constructional elements; (4) that some or all of the shelves be either adjustable, or if they are part of the construction, so designed that larger articles may be accommodated.

These requirements are adequately met in the china cabinet described in this article. It was designed as a piece of living room furniture but it could easily be modified if a built-in cabinet is desired.

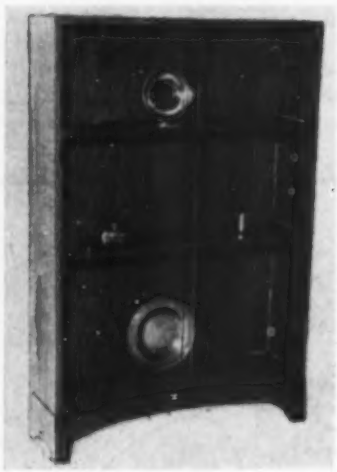
The front inside edges of the carcase together with the top and bottom of the cabinet



Cigarette tray made of a discarded milk can



Method of assembling sides, bottom, top, and base of china cabinet



China cabinet in American walnut

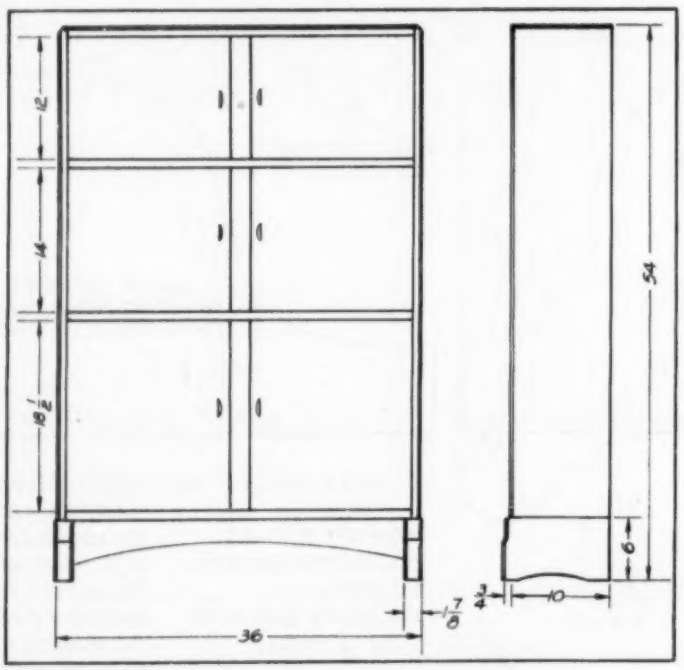
— Courtesy of Central State College, Edmond, Okla. Asbury Smith, head of industrial-arts department

are each grooved twice for the sliding glass fronts. The depths and distances between the grooves are shown in the drawing. Note that the grooves in the top piece are ⅛ in. deeper than those in the sides and bottom. This allows the plate glass doors to be inserted by pushing them upward into the deeper grooves. They will then clear the edges of their lower supports and will readily fall into their lower grooves while still not falling out of the upper ones. In work of the highest class, or where the glass will be frequently moved, the lower grooves should be made a little deeper and a very thin strip of polished ebony or rosewood glued along the bottom thus reducing friction and wear.

If it is necessary to keep the dust out of the cabinet the small spaces between the sliding glass sheets may be closed by attaching a narrow piece of felt or other soft material to the front face, near one edge, of the rear piece of glass.

Finger grips ground into the glass are helpful and serve to prevent finger marks and smears. Note that for sheets below the eye level the finger grips should be ground a little above the vertical center of each sheet. If they are ground at the center they will appear to be below center when viewed from the normal eye level.

The two shelves of the cabinet are each made up of three pieces of wood. The front and back pieces are each jointed into the carcase and are grooved and rebated as shown. The middle piece is loose and also rebated and fits easily between the fixed pieces. It can be removed entirely to allow accommodation for large objects. One face should be grooved so



Dimensioned drawing of china cabinet

that plates, etc., can be supported by standing them in the groove and leaning them against the back of the cabinet.

An alternative arrangement would be to have one fixed shelf (solid) and one completely removable shelf.

The base illustrated here is a distinct variation from the usual four legged or plinth type. The shaping and chamfers provide for a large measure of light and shade and a subtle interest which is particularly appropriate in view of the probable contents of the cabinet.

NEW MATERIALS IN WOODWORKING

ROBERT J. SCHAEFER

Williamsville Junior-Senior High School
Buffalo, N. Y.

Industrial-arts instructors are constantly on the lookout for new techniques and new materials. The following is a dissertation concerning some new materials in woodworking.

Many of these materials have been with us for quite some time but perhaps we have neglected or possibly not thought about them in a more favorable light.

NEW MATERIALS IN WOODWORKING

NAME OF MATERIAL	CHARACTERISTICS	USES	SUGGESTED FINISH	POSSIBLE AGE GROUPS
Homosote	Easily cut, Soft, Porous, ½" thick	Stage Scenery, Cut-outs, Toys	Water colors, Shellac, Varnish, Paint	Elementary, Jr. – Sr. High
Flexboard	Easily worked with hand tools	General Construction, Projects	Wax, Shellac	Jr. – Sr. High
Upsom Board	Stiff construction, Easily cut, Soft	Tiles, Hotplates, Toys	Water colors, Shellac, Varnish, Paint	Elementary
Weldtex	Rough texture on one side other than that same as plywood	General Project Construction	Shellac, Varnish, Lacquer	Jr. – Sr. High
Service Board	Porous, Easily cut	General Projects	Water colors, Shellac, Varnish, Paint	Elementary – Junior High
Johns Mansville Ceiling Panels	White color one side	General Projects	No further finish needed, decorated with water colors	Elementary – Junior High
Urea Plastic Bakelite	Worked same as wood	Combination Wood, Metal, Plastic Projects	Buffed, Wax	Jr. – Sr. High
Masonite or Press Board	Worked same as plywood	Same as Plywood	Paint	Jr. – Sr. High
Building Board Johns Mansville	White Glaze Coat finish one side	Cutouts, General Construction	No further finish needed, may be decorated with paint	Elementary – Junior High
Compregnated Plywood	Very hard and strong	Boat Hulls, Airplanes	Shellac, Varnish	Sr. High
Flexwood	Thin veneer 1/85" thick mounted on cloth backing, making it flexible	Can be glued to any irregular-shaped surface	Shellac, Varnish	Sr. High

Various materials for use in the school shop

The materials shown in Figure 1, can all be purchased very reasonably from most lumber companies: (1) Homosote — tile, (2) Upsom Board — tile, (3) Service Board — flower holder, (4) Ceiling Panels — spool holder, (5) Flexboard — lamp, (6) Weldtex — flower box.

Homosote is a sturdy, soundproof board which can be used in a variety of ways such as tiles, cutouts, toys, etc., but perhaps its greatest use would come in the construction of stage scenery wherein it is an excellent medium and very reasonably priced. It can be finished with shellac, paint, tempera colors, water colors, or varnish.

Upsom Board has practically the same characteristics as Homosote except that it is not as sturdy.

Johns Mansville Service Board and Ceiling Panels are well recommended for elementary industrial-arts work. A wide range of projects can be made with these two materials depending only upon the student's or instructor's imagination and ingenuity.

The Flexboard lamp and similar projects can be very easily adapted to junior-senior high school shopwork. Flexboard is easily worked with hand tools.

Weldtex is already making inroads in many industrial-arts shops as shop instructors are becoming more and more acquainted with its possibilities. It has many of the same characteristics as plywood except one face has striated grooves. Perhaps its greatest advantage is the fact that its finish can be highlighted with contrasting colors.

The accompanying sheet is a breakdown of these and some other new materials that could be used to advantage by industrial arts instructors in their lesson planning. It is by no means an exhaustive list, but it is a beginning. This new field of materials is opening up to us and we should all be acquainted with their possibilities.

HOME ALUMINUM

Jerry Gammon*

A new material for use in the school and home workshops — aluminum — is for the first time being offered craftsmen in the Louisville, Ky., area. The product is Reynolds Home Aluminum — strong, yet soft enough that any tool, hand or power, ordinarily used with wood may be applied to it without damage to the tool. The material, engineered especially for the home or farm workshop, was made available by Reynolds Metals Company, producers of strong aluminum alloys for industrial use.

The product comes in a variety of shapes and finishes: sheet (embossed or plain), rod, bar, tubing, and angle. In addition, a variety of aluminum fasteners are available with Home Aluminum at hardware and building supply dealers.

A group of craftsmen have tested Home Aluminum, and its members believe that the availability of such material will greatly expand the home workshop enthusiast's horizons.

*Reynolds Metals Co., Louisville, Ky.

This handy occasional table is one of the many items which can be made with Home Aluminum

The marketing program has just been launched in Louisville, Ky., demonstrating the shapes and finishes of the product, and illustrating some of the many projects the craftsman may undertake with this metal.

A complete home workshop has been set up at the Reynolds General Sales Office in Louisville. Here the firm also displays an attractive array of items, ranging from simple auto oil-drip pans, to more involved pieces of furniture, demonstrating the versatility of Home Aluminum.

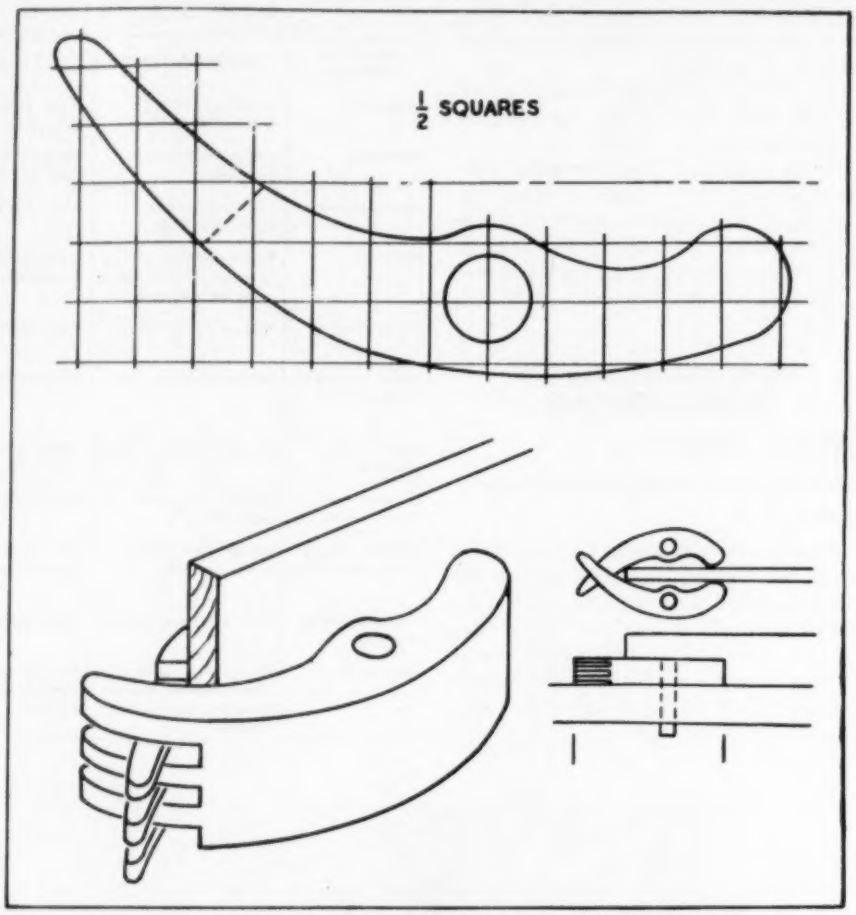
Disbelieving at first that a metal could be safely cut with tools heretofore reserved for woodworking, it has been found that little or no difficulty is experienced in sawing, planing, or drilling Home Aluminum with ordinary woodworking tools. A standard jointer-planer was used with the product for many months in the Reynolds workshop with no apparent dulling or damage to its sensitive blade. The company emphasizes, however, that other types of aluminum are harder, and may damage such sensitive tools.

PLANING THIN WOOD

PERCY W. BLANDFORD
Stratford-on-Avon, England

When a thin piece of wood has to be hand planed on its edge it will not stand unsupported on the bench, and if it is held in the vise it may bend under the pressure of the plane so that the resulting edge is not straight. The device described here is intended to hold wood of various thicknesses rigidly while planing on the top of the bench.

It is made of any hard close-grained wood. The sizes given will hold wood up to ¾ in. thick, but the range of sizes is governed by the spacing of the dowel holes in the bench top. The dowels are fixed in the blocks but they rotate freely in holes in the bench top. The device can be removed completely when not needed. When a board is pushed between the sidepieces, it forces the overlapping ends apart so that the jaws press against the wood. The action of planing tightens the grip, but pulling the board back releases the grip.



A device for supporting thin wood while planing its edges

If the device is made to other sizes than those given, watch the following points: the greatest thickness that can be held equals the space between the parts around the dowels, and the distance between the jaws in the fully open position should be the same as this; when the jaws are fully closed the opposite ends should still have ample overlap.

TIN LIGHTING FIXTURE

ENID BELL
Instructor
School of Fine and Industrial Art
Newark, N. J.

Tin has a pleasing color and reflective quality approximating that of silver that makes it an attractive material for lighting fixtures, whose handsome appearance belies their low cost. The ease with which tin may be manipulated and soldered even by those with little or no previous experience in metalwork is also a recommendation. If lacquer is applied to it after a scrupulous cleaning and polishing with fine steel wool, tin will neither tarnish nor rust for many years to come. Simple geometric ornament hammered with screw driver, flattened nail points, etc., may be used to enliven the surface. Elaborate and painstaking designs are less effective than simple and bolder designs.

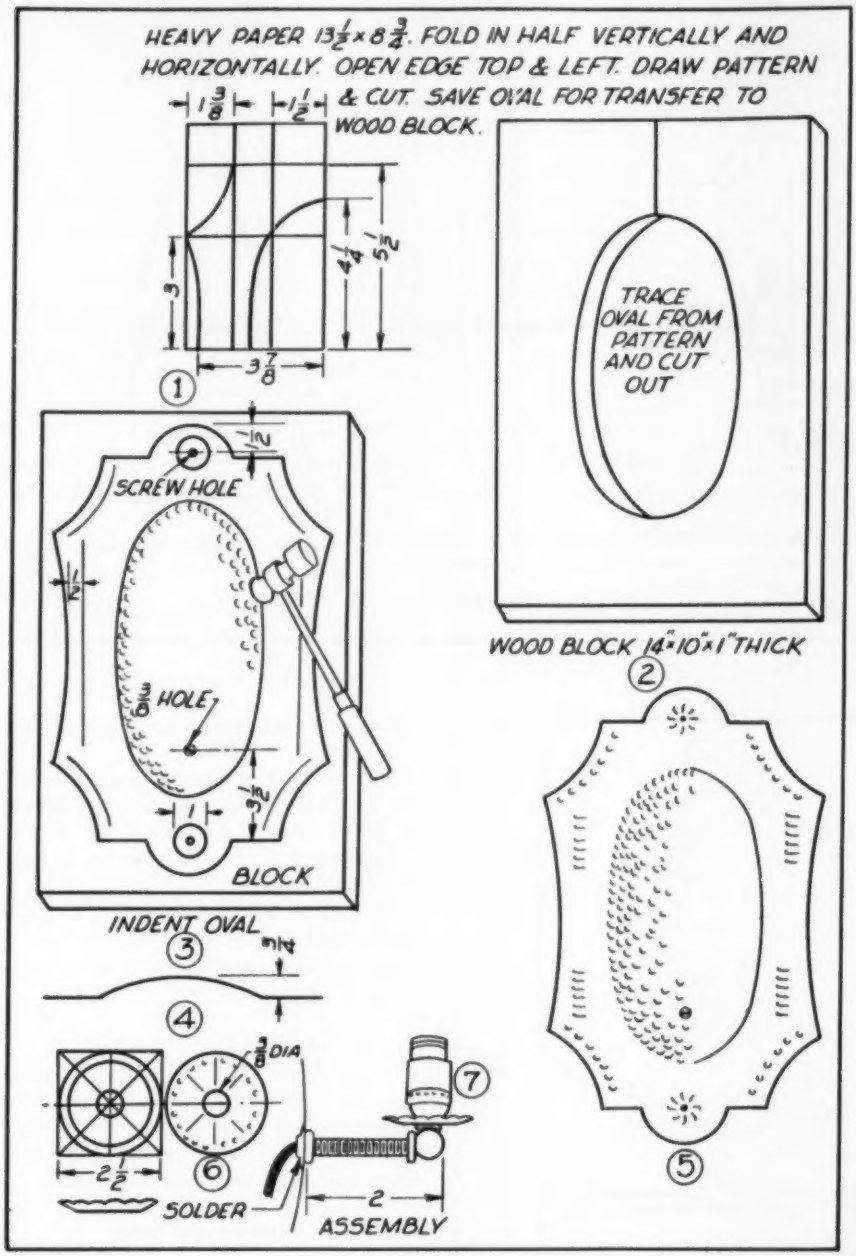
Tools and Materials

Scissors, ruler, pencil, crayon, snips, small ball-peen hammer, soldering iron and solder, ⅜-in. hollow punch, a large screw driver, 20*d*. nails for making punches of various kinds.

Heavy pattern paper, an 18 by 24-in. sheet of lightweight roofing tin, a 1 by 10 by 14-in. wood block, one piece of threaded ⅛-in. pipe 2¼ in. long, one elbow fitting to fit the ⅛-in. pipe, 2 rosette washers.

Procedure

Draw the pattern on heavy paper as indicated, cut outlines and open to full size. The oval section is transferred to wood block and cut out. Over this opening the oval marked



Tin lighting fixture

on tin is hammered to a maximum depth of about ¾ in. to accommodate the wall wires.

Cut an oblong piece of tin of the required size. Using a crayon pencil, draw vertical and horizontal lines through the center. Lay the pattern on tin and draw around it.

Mark the three holes and design guidelines. Punch out the screw holes with the large nail over a solid area of the block. The pipe hole should be indented with the punch on both sides of the tin and cut through by repeating this process rather than by a single heavy blow which will buckle the surrounding area beyond remedy.

Start the oval hollow by hammering lightly around its edge. Turn tin and flatten frame on wood block by hammering over a thick pad of paper to avoid marring surface. The depth of the oval is increased gradually by repeating these steps, each time hammering further toward the center.

Great care must be taken to avoid buckling, fracturing, or indenting frame area. The designs, hammered on the back of the tin, over the wood block, help to flatten it out. Dots and lines should be practiced first on a piece of scrap to determine the requisite force of the hammer blow on the nail head and screwdriver handle.

Cut out the rosette washer that is to be placed under the socket. Indent the lines with screw driver. Hammer the dots in reverse.

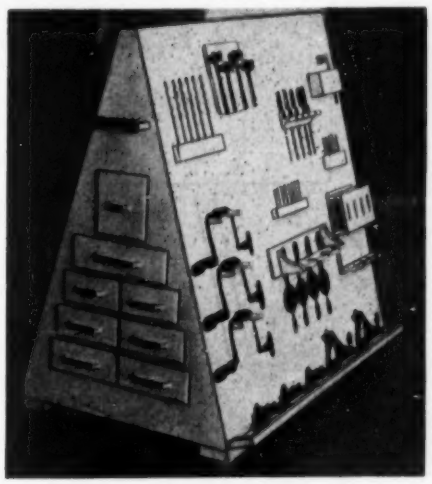
Polish the completed fixture thoroughly with fine steel wool. Avoid finger marks and brush off all particles of steel wool. Apply an even coat of clear lacquer to the surface. Better results will be obtained if the tin is heated slightly first.

Assemble and attach the wired socket, rim, threaded pipe, elbow, and washers. Solder projecting end of pipe to back of fixture. If brass parts are used they should be painted with silver or aluminum to match the rest of the fixture.

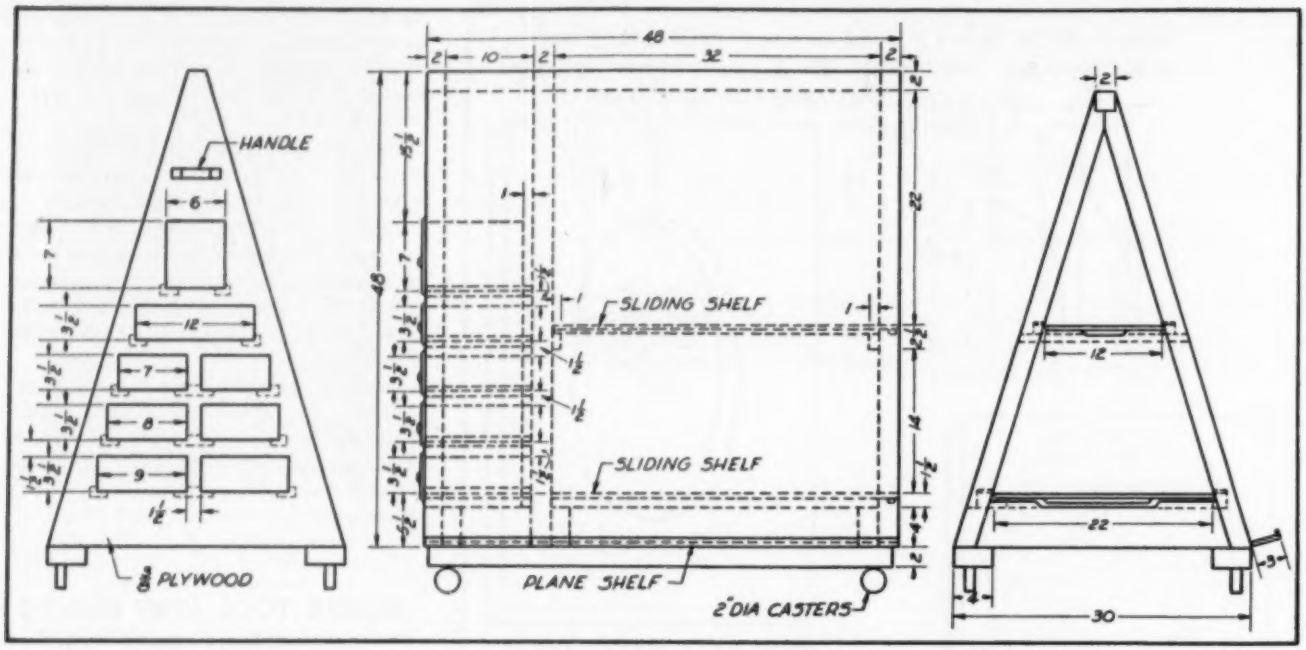
MOBILE TOOL UNIT BRINGS INDUSTRIAL ARTS TO ELEMENTARY SCHOOL

LeROY ROWAND
Assistant Principal
School District No. 201
Oak Harbor, Wash.

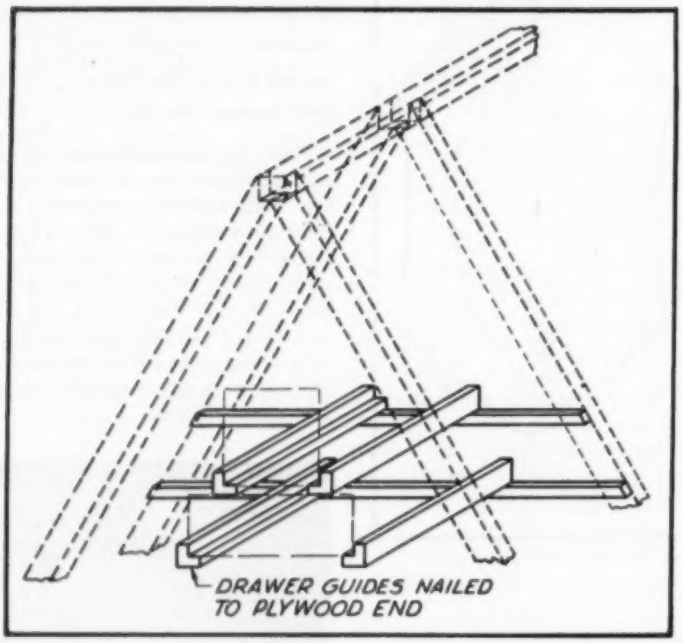
There has long been a need for some practical convenient way to bring industrial arts to a larger number of elementary school children. Most instructors will readily agree that the problems of tools and equipment in schools where there is no special room allotted makes handwork with tools almost too involved to undertake. This mobile tool unit is an attempt to make industrial arts on the elementary level more practical and more easily integrated into the school program.



Mobile tool unit



Details of mobile tool unit



Drawer guides of mobile tool unit

The Reasons for Constructing This Mobile Unit

My district feels that there is a definite need for teaching industrial arts on the elementary level.

As in most small schools we have no special room allotted for industrial arts.

The high school shop is neither practical nor available for grade school use: (1) The tools in the high school are too advanced for grade school children. (2) High school workbenches and tables are out of scale for elementary pupils. (3) The shop schedule is overcrowded with the high school program. (4) The physical arrangement of buildings would involve transportation difficulties.

Some tools and materials are available but so disorganized that they weren't utilized by individual teachers.

Problems Encountered in Constructing This Unit

The unit has to be large enough to satisfy the tool needs of the industrial-arts program on the elementary level.

The unit must be small enough to pass through doorways.

The unit must be light enough to be transferred easily by primary children.

This unit solves the problem of limited funds provided for handwork.

Future Plans for This Unit

To construct other mobile units, changing the size to meet the physical scale of the children: (1) To equip these units with tools scaled to each partciular group. (2) To store these units where they are most accessible.

MATERIALS AND COSTS

Quantity	*Description*	*Size*	*App. Cost*
2	Base runners	2 by 4 by 48	$ .60
2	Angle braces	2 by 4 by 29	.60
6	Side braces	2 by 4 by 48	.80
1	Ridge pole	2 by 4 by 48	.10
1	Plane shelf	½ by 3¼ by 48	.20
2	⅜ Plywood sides	48 by 48	8.00
1	⅛ Plywood shelf	33 by 22	1.25
1	⅛ Plywood shelf	33 by 12	.75
1	⅜ Plywood end	29 by 48	2.50
1	⅛ ply drawer (sides and back)	30 by 7	.38
1	⅛ ply drawer (sides and back)	34 by 3½	.25
2	⅛ ply drawer (sides and back)	29 by 3½	.45
2	⅛ ply drawer (sides and back)	30 by 3½	.50

2	⅜ ply drawer (sides and back)	31 by 3½	.58
1	¾ ply drawer front	6¼ by 7¼	.13
1	¾ ply drawer front	3¾ by 12½	.13
2	¾ ply drawer front	3¾ by 7¼	.15
2	¾ ply drawer front	3¾ by 8¼	.15
2	¾ ply drawer front	3¾ by 9¼	.15
Masonite drawer bottoms		4 sq. ft.	.44
1	Quart enamel		1.90
1	Set casters		1.75

David Thomas was born in 1794 in Wales, and became successful in the iron industry there. He came to America in 1839 to build a blast furnace for a company in Catasauqua, Pa. The furnace erected there under his direction became famous in America for using anthracite coal successfully in place of charcoal. In 1852, Mr. Thomas installed engines which doubled the air pressure customarily used in blast furnaces at that time. This greatly increased the output of iron, and the practice came to be universally imitated. — *Steel Facts.*

CANED STOOL

J. HOWARD WADDELL

Calvin Coolidge High School
Washington, D. C.

The caned stool makes an interesting shop project, and comprises many operations which are basic in woodworking. It also is a very useful piece of furniture for the house where it may serve as a child's stool, footstool, etc.

The material should be some hardwood with a nice grain such as birch, maple, cherry, or oak. Parts required are as follows:

No. of pcs.	*Name of part*	*Size*
4	Legs	1¼ x 1¼ x 10½ in.
8	Rails	13/16 x 13/16 x 10⅝ in.
2 pcs.	Cane	½ x 35 ft. long

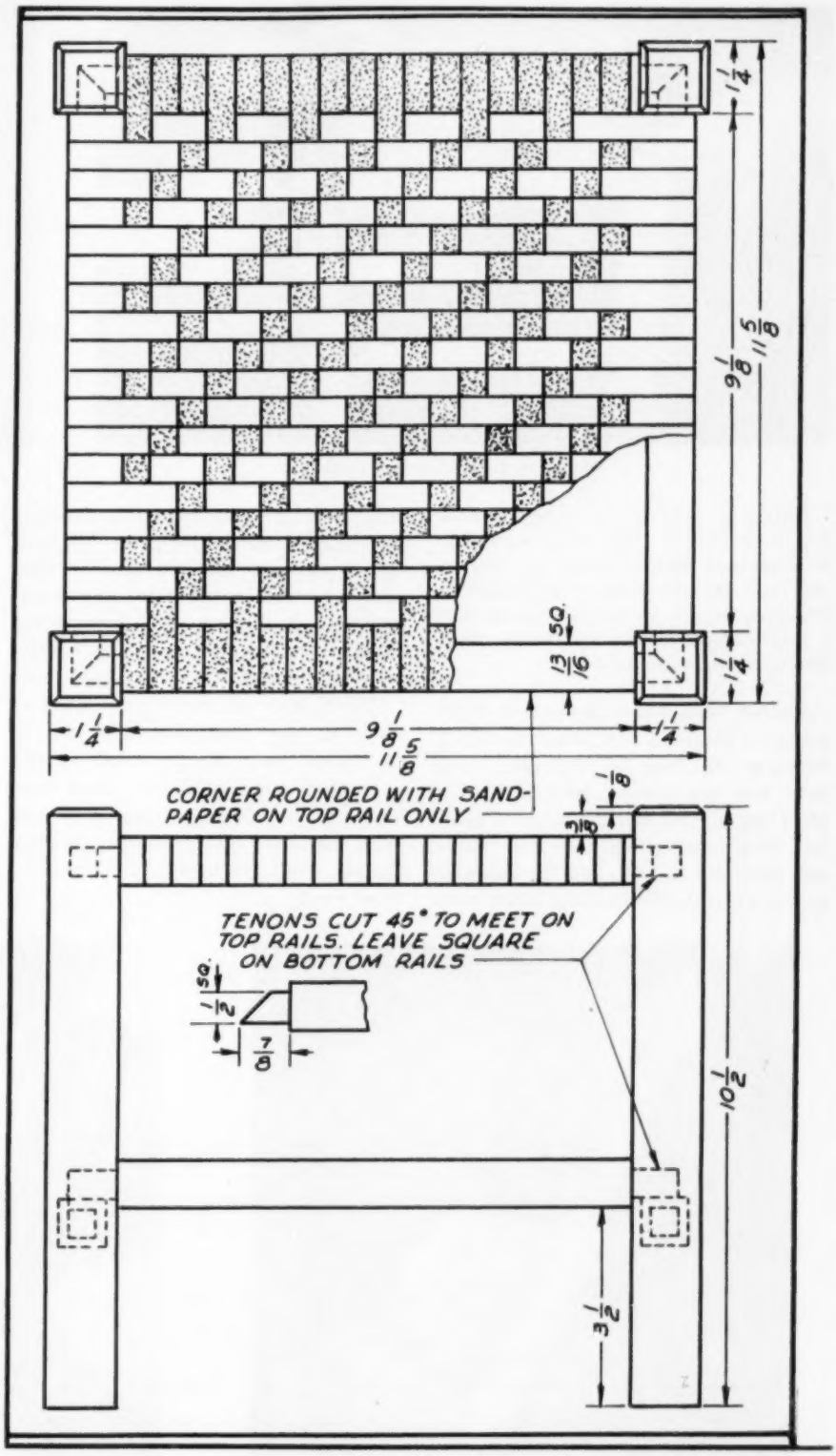
Order of Procedure

Legs

1. Cut stock to size.
2. Lay out mortises.
3. Bore holes for mortises.
4. Chisel out mortises.
5. Lay out and plane chamfers.
6. Surface.

Rails

1. Cut stock to size.
2. Lay out for tenons.
3. Cut tenons.
4. Miter ends of tenons on top rails where they meet in the mortises.
5. Round corners on top rails slightly.
6. Surface bottom rails.



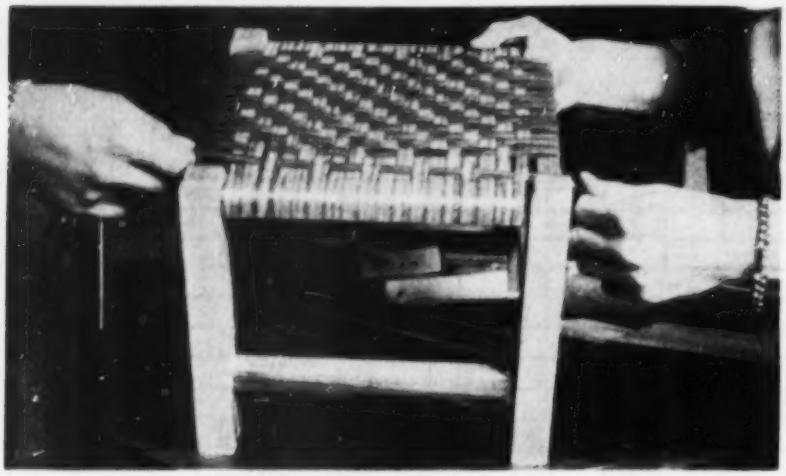
Detail for stool

Assembling

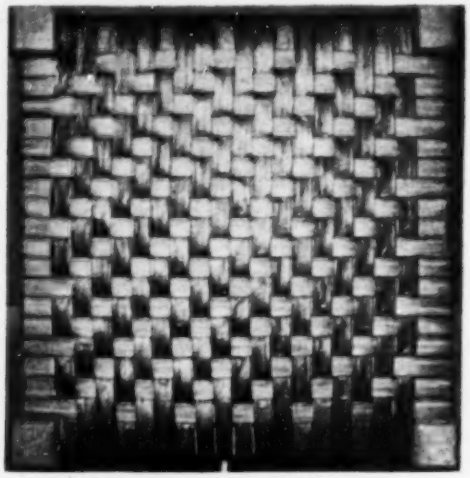
1. Glue and clamp all joints.
2. Test for squareness.

Weaving seat and finishing

If there is staining to be done, it should be done before the seat is woven. The seat should have a coat of shellac after it has been woven. Finish otherwise as desired.



Weaving seat of caned stool



Seat woven with imitation cane

There is an imitation cane or cord of wood pulp on the market which should serve well. It is made in different colors and may be used for a solid colored seat or in combination. Directions for weaving may be obtained from a shop textbook or from the library. Many different patterns are available.

Canton, Ohio, was settled in 1805. Work began on Canton's first important steelworks in 1872, but the first open hearth steel was not poured until 1875. The plant made "tool steel, machinery steel, cast steel, and spring steel." A rolling mill was built in 1894, and the following year a crucible steelmaking plant went into operation. In 1903–1904 another open hearth steelmaking plant was built and it was here that the pioneer alloy steel for use in automobiles was manufactured. Another company brought the electric steelmaking furnace to Canton in 1916. Today, the city has about 1,300,000 tons of electric steelmaking capacity, more than any other city in the United States. It has a total capacity to produce nearly 1,800,000 tons of steel, and also has blast furnace and coke oven capacity. Three companies now operate steel furnaces in Canton. — *Steel Facts.*

SANDPAPER CUTTER

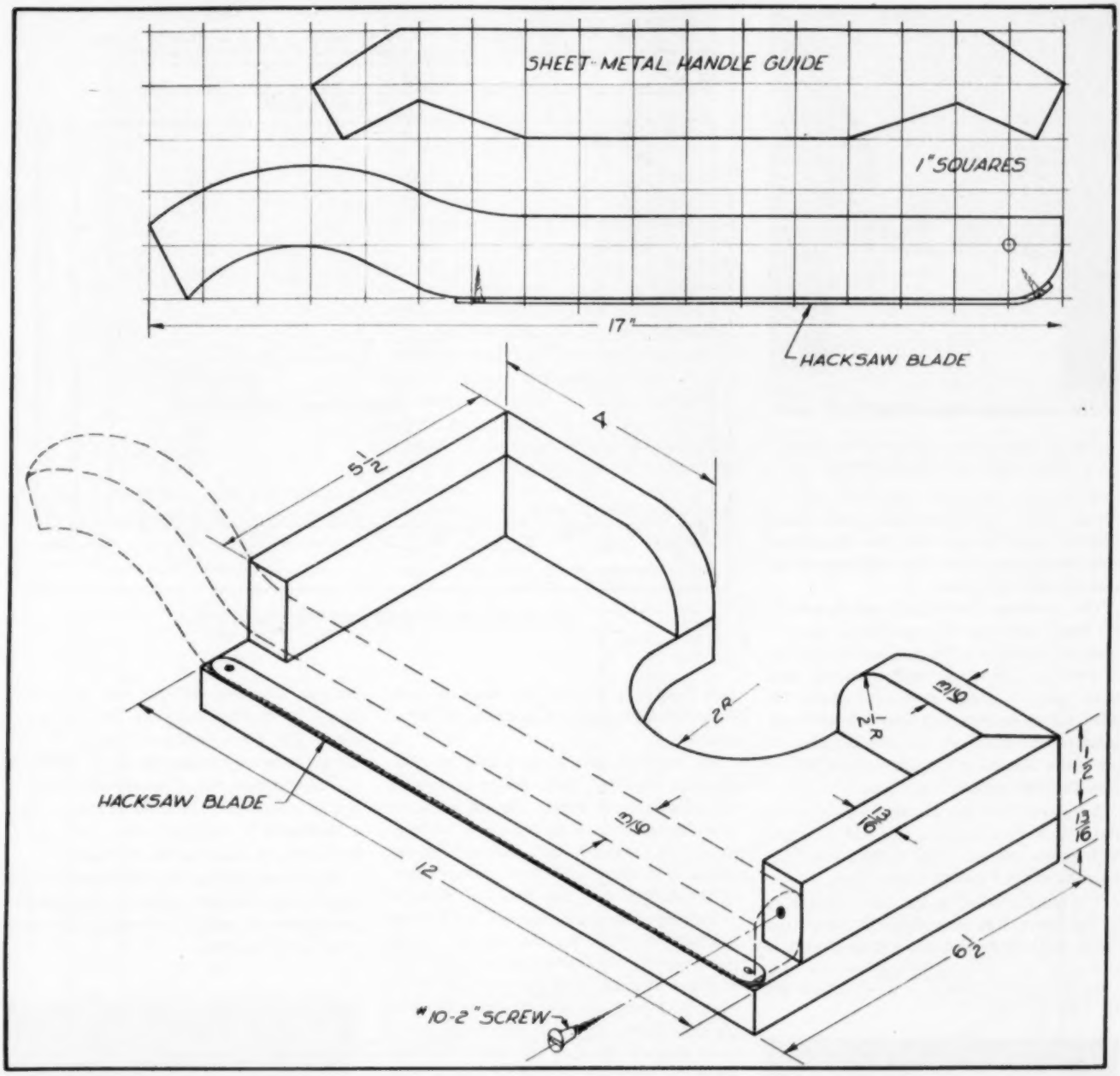
E. MILTON GRASSELL
Graduate Student
Oregon State College
Corvallis, Ore.
and
DEL BLANCHARD

This handy sandpaper cutter was designed by Professor Martin F. Johnson, Oregon State College. It works somewhat like a paper cutter and may be used for flint and garnet paper as well as for the various abrasive cloths.

Students, teachers, and home craftsmen find this method of cutting superior to the more conventional ways such as tearing it along the

Fig. 1. This handy sandpaper cutter works very much like an ordinary paper cutter
— Photo by Francis R. Schultz

Fig. 2. The knife edge for cutting the sandpaper consists of two hacksaw blades
— Photo by Francis R. Schultz



Details of the sandpaper cutter

edge of a square or tearing it over the edge of a workbench.

One hack-saw blade is attached to the baseboard and the other is screwed to the underside of the cutting arm. After the sandpaper has been placed on the baseboard the cutting arm is lowered; then the material may be easily and neatly torn as shown in Figure 2.

Natural gas production reached a new high in 1952 of 8.6 trillion cubic feet. This was a gain of 8.4 per cent over 1951. — *Petroleum Newsnotes.*

A MULTIPURPOSE PORTABLE TEACHING AID

HOWARD R. SCHRAMM
Industrial Arts Teacher
High School
Shadyside, Ohio

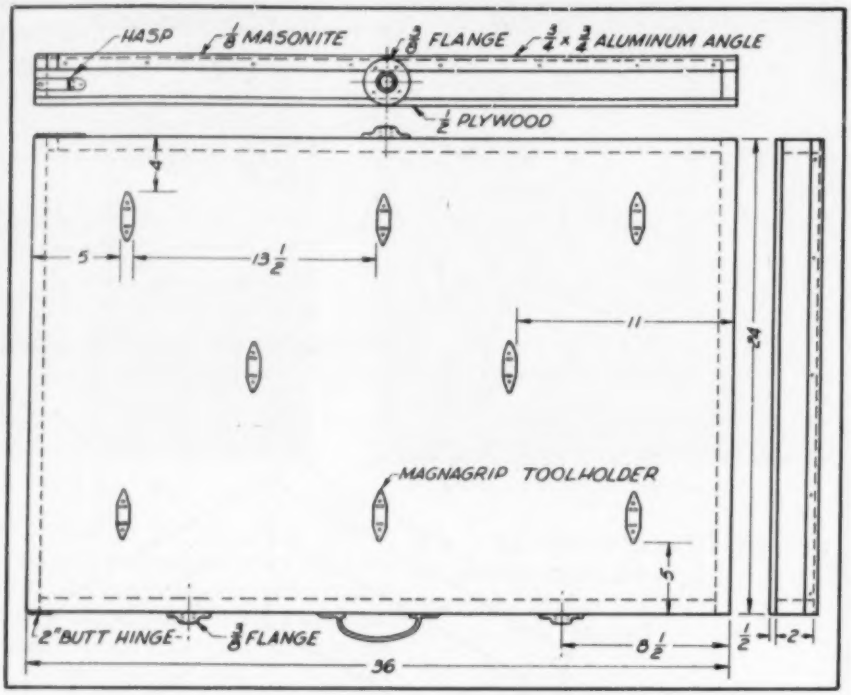
A magnet board, green chalkboard, *Suede-Tex* or felt board, storage space, easel, and pointer are incorporated in this multipurpose portable teaching aid. It can be easily constructed in the school shop with the minimum of expense.

Constructing the Aid

The magnet board is a piece of ½-in. plywood 24 x 36 in. in size. However, the board can be made any size to meet individual needs or requirements. Three coats of green chalkboard paint[1] was applied to this board. Eight Magnagrip Jr. magnetic holders[2] were fastened

[1]Can be secured from: Endur Paint Company, 46 Cornhill, Boston 8, Mass.
[2]Can be secured from: Phelon Magnagrip Co., East Longmeadow, Mass.

The multipurpose portable teaching aid ready for transportation



Detail of multipurpose portable teaching aid

to the board with escutcheon pins. Small magnets could be used, but the Magnagrips were selected because of their excellent ability to hold most hand tools.

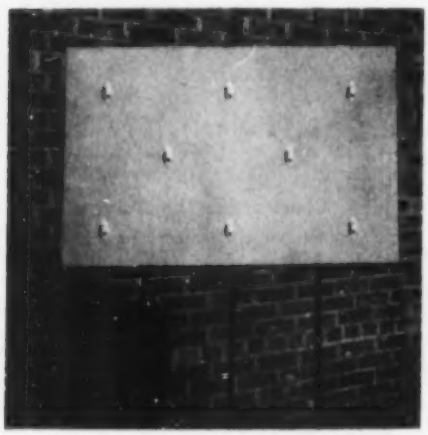
The reversible *Suede-Tex* or felt board and the green chalkboard is made from a piece of ⅛-in. Masonite or ¼-in. plywood 24 by 36 in. in size. One side of the board is painted with three coats of green chalkboard paint; the other side is painted with Don Jer undercoat adhesive and while still wet emerald green or pea green *Suede-Tex*[3] is sprayed on with a Don Jer high velocity spray gun.

A wooden frame two in. wide is constructed from ¾ or 13/16-in. stock. One end is hinged with a 2-in. butt pin hinge at the bottom and fastened at the top with a small hasp.

The magnet board is fastened with screws to the frame. The reversible chalkboard and *Suede-Tex* board slides into a groove which is made from a ½-in. aluminum angle. A ¾-in. aluminum angle would be more satisfactory if available.

The two legs are 35-in. pieces of ⅜-in. pipe that screw into ⅜-in. flanges fastened to the bottom of the frame. The adjustable inclined leg is made up of two pieces of ⅜-in. pipe 33 in. in length and connected together with a ⅜-in. coupling. Rubber caps are placed on the ends of each leg. Two 3-in. pieces of ⅜-inch pipe threaded on one end and flattened and rounded off on the other end serve as an adjustment for the inclined leg. A ¼-inch hole is drilled through each flattened end and a ¼-in. bolt, wing nut, and washer fasten these pieces together. One end is screwed into a ⅜-in. flange fastened to the top of the frame while the other end is screwed into a ⅜-in. elbow and then into the inclined leg. The legs can be stored in the opening or storage space between the boards. A handle is fastened to the bottom of the frame to facilitate carrying.

[3]Can be secured from: Don Jer Products Co., 51-47 69th St., Woodside, L. I., N. Y.



The magnet board

Using the Aid

Hand tools can be placed directly on the Magnagrip Jr. magnetic holders, and names of parts, and the like can be written on the chalkboard surrounding the magnet. Strips of tin plate glued or taped to the back of charts, pictures, diagrams, and the like can be easily fastened to the magnet board.

Strips of muslin glued to the back of charts, pictures, diagrams, and the like serve very nicely in holding them to the *Suede-Tex* board. The green chalkboard comes in very handy where no chalkboards are available. It can also double for a projection screen. A pointer made from a ⅜-in. dowel rod on which a Magnagrip Jr. magnetic holder is attached is kept firmly in place on one of the legs.

The writer feels that this aid has contributed considerably to more effective and efficient presentation as well as to increase and maintain student interest.

The "Suede-Tex" board

BILL OF MATERIAL

Quantity	*Material*	*Size*
1	Plywood	½ x 24 x 36
1	Masonite	⅛ x 24 x 36
2	Softwood	¾ x 2 x 24
2	Softwood	¾ x 2 x 34½
1	Aluminum angle	¾ x ¾ x 95
3	Pipe flanges	⅜ x 2½ dia.
2	Pipe	⅜ x 35
2	Pipe	⅜ x 33
2	Pipe	⅜ x 3
1	Pipe coupling	⅜
1	Pipe elbow	⅜
8	Magnagrip Jr. toolholder (9 if pointer is made)	
1	2-in. Butt hinge	
1	Small hasp	
1	Handle	
3	Rubber caps	
1	¼-in. Bolt and wing nut with washer	
	Green chalkboard paint	
	Don Jer undercoat adhesive	
	Suede-Tex	

Statistics prove that 2400 children from 5 to 14 years old were killed in motor vehicle accidents and 1250 were drowned. — *The National Safety Council.*

CHALKBOARD TECHNIQUE

HOWARD R. SCHRAMM
Industrial Arts Teacher
High School
Shadyside, Ohio

Many teachers have used the chalkboard* or blackboard for many years, but fail to realize its possibilities or the proper technique in using this dynamic teaching aid. The purpose of this article is to relate a few techniques in the proper use of the chalkboard which have proved useful to the writer.

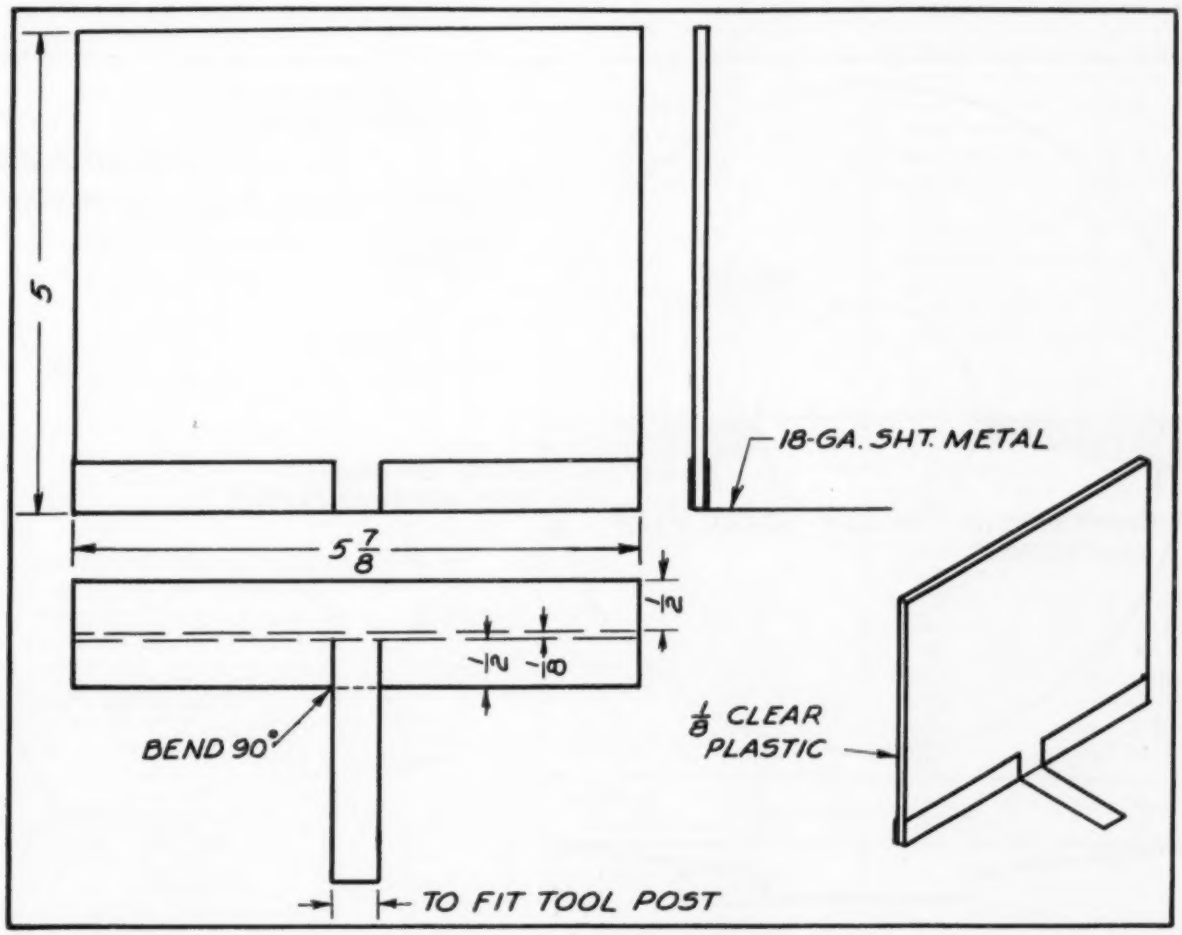
The chalkboard has innumerable advantages. We know that 75–85 per cent of what we learn is through the sense of sight. It is a convenient aid which is readily available or can be easily made by painting a piece of plywood or Masonite with chalkboard paint. The chalkboard is also a most progressive and flexible aid.

Considerable planning should go into what we place on the chalkboard. One should know what to put on; where to put it on; and when to put it on. Materials such as chalk, erasers, pointer, straightedge, compass, protractor, and other material needed in the presentation should be readily available.

Many teachers use either white or yellow chalk and never realize the advantages gained by utilizing colored chalk. Confucius said that one picture is worth ten thousand words. Diagrams can be outlined with black or green chalk (depending upon the type of board being used) before class and filled in with colored chalk during the presentation of material. Yellow, orange, and white chalk (in that order) are preferred, while blue, green, and red chalk (in that order) should be used for emphasis and the like.

Legibility is very important in using the chalkboard. All material should be neatly printed. The printing should be large enough for all in the class to see. Bearing down firmly with the chalk and breaking a piece of chalk in two and using the broken end will help prevent *chalk squeak*. One should always stand clear of material placed on the board. Be sure to leave the work on the board long

*Refers to the green type of chalkboard.



Chip guard for metal lathe by Geo. W. Deffendahl, Central High School, Evansville, Ind.

enough. Also remember that you are talking to the class and not to the chalkboard. Key points to be stressed (such as new or unfamiliar words) should be underlined with a different colored chalk. It is sometimes helpful to put problems, etc., on small note cards which are placed in the chalk tray.

ALUMINUM TIDBIT TRAY

PETER G. POLOWNIAK
Industrial Arts Teacher
Passaic, N. J.

The aluminum tray, shown in Figure 1, can be made successfully by beginners in a sixth-grade general shop as well as by advanced students in the senior high school. The beginners will undoubtedly leave out the center design whereas the advanced student can either chase in and raise or etch an appropriate design of his own choice. Figure 2 shows a tray made out of a 16-ga. aluminum circle by an eighth-grade student who had no previous experience in metalwork. The design has been chased in and raised on a lead block.

In order to make this tray the following tools and equipment are necessary: maple tray mold, circular cutting shears, dividers, smooth flat file, 2-in. fiber mallet, rule, cross-peen hammer, ⅜-in. dapping punch, steel wool, emery cloth, soft lead pencil, compass, buffing compound, and buffer.

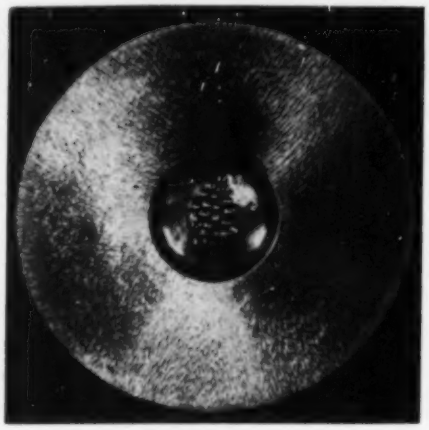


Fig. 2

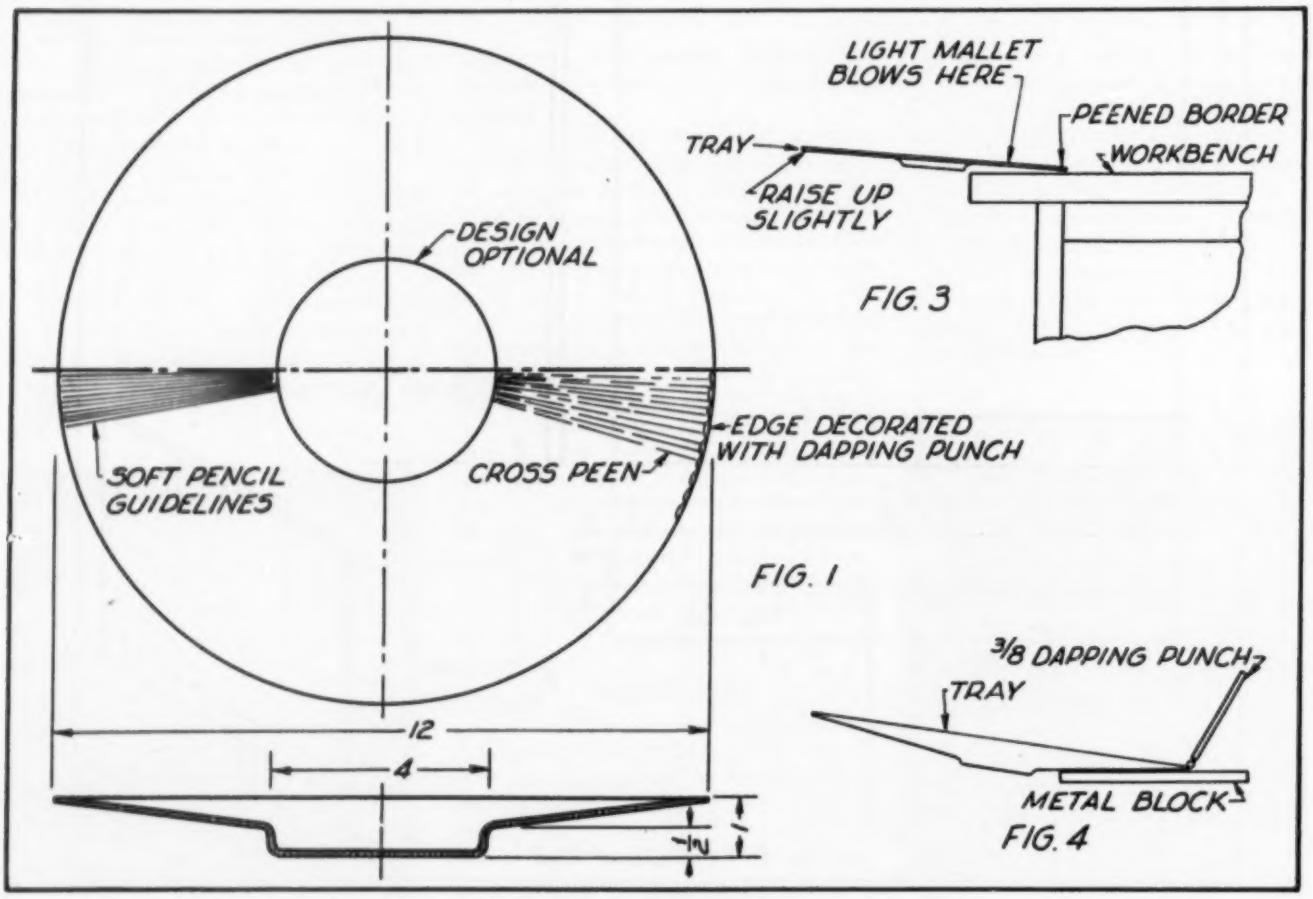
Procedure

1. Scribe a 12-in. circle on the 16-ga. aluminum sheet.

2. Cut out the circle with shears, file the edge smooth and finish it with emery cloth.

3. Scribe a 4-in. circle in the center with a soft lead pencil compass. This 4-in. circle will be the well of the tray.

4. The remaining area will be cross peened to give a sunburst effect. This then requires all cross-peen marks to radiate from the center. In order to get this effect accurately, it is necessary to draw guidelines with a pencil for the cross peening. See Figure 1. Without guidelines it is difficult to produce this effect accurately. In cross peening, follow the lines. Start at the circumference of the small circle and peen toward the edge of the tray. It is not necessary to follow the lines exactly. They are merely guides for direction. Select a hammer that will give a long slender peen — but not too sharp — else you may cut through the metal. The blows should be even and not too hard. When the peening is finished the metal is no longer flat, but wavy and distorted from the stretching caused by the hammer blows. This condition is expected. To correct this: lay the metal on a flat surface and using a fiber mallet, strike light blows over the whole surface. Then turn the metal over and do likewise on this side. Continue this operation until the



Aluminum tidbit tray

metal is flat. If the metal does not seem to flatten out, it means that it has become hard, and requires annealing. One way to anneal aluminum is to coat one surface with ivory soap. Just take a cake of ivory soap and rub it over the surface. Both the metal and the soap should be dry. The soap will leave white deposits over the surface. Next place the aluminum over a flame, with the soap side up, and the flame underneath. Play the circle evenly over the flame until the white soap deposits turn a dark brown. Then plunge aluminum into cold water. It should now be soft again.

5. The well is formed in a maple tray mold. The mold for the tray can be made out of a piece of maple 2 in. thick. It does not have to be as large as the 12-in. tray. A 6- or 7-in. square piece is ample. Turn the 4-in. well, 5/8 in. deep. In order to form the well in the center of the circle, set the tray with the 4-in. circle over the well in the mold as carefully as you can. Next with a fiber mallet strike four light blows 90 deg. apart at the circumference of the 4-in. circle where in your judgment, the well should be in the mold beneath. This should center the well. If the first attempt is off center, you may flatten out the four slight depressions made with light blows of the mallet, adjust the aluminum circle over the mold, and try again. When you have located the 4-in. circle to your satisfaction, form the well with light blows struck closely together with the fiber mallet. Continue striking blows around and around until well is formed.

6. It will be noticed that the peened area which forms the border of the tray is not flat but turns upward, as shown in Figure 1. A mold for raising the border may be made by turning a large 12-in. piece of wood accordingly. Otherwise lay the border on the edge of a workbench, Figure 3, and holding the opposite end of the tray, strike light blows with a fiber mallet on that part of the tray which sets on the workbench. Keep working tray around until it is raised to your satisfaction.

7. The outside edge of the tray should be squared off with a file. The beaded edge is made as follows: lay the border on a flat piece of metal, and hold a 3/8-in. dapping punch at a slight angle on the edge of the tray, as shown in Figure 4. Strike the punch lightly with a hammer, moving the tray around until the edge is all beaded.

8. Clean with steel wool and polish on buffer as desired.

If the tray loses its shape during any of the operations, it can be very easily put back into the mold and reshaped.

This tray has proved to be a popular one because it is attractive, useful, and practical for serving snacks, tidbits, and the like.

HOW TO ENAMEL METAL—AN INFORMATION SHEET

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and
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Enameling is the process of fusing a glassy material onto the surface of metal. The enamel is made from glass forming materials and is available in a wide variety of colors. It is obtainable in powder, chip, and thread form.

Enameling can be done successfully in the average school shop with a minimum of special tools and equipment. The most essential item is a source of heat up to 1500 degrees F. A kiln is most desirable; however, the process can be accomplished with pleasing results over an open flame such as a bunsen burner, gas torch, or melting furnace.

The variety of project designs is, of course, limitless. A few suggestions as to the possibilities and limitations will serve as a guide to the student who is then free to work out his own designs. In general, sharp points such as a star should be omitted as the points will heat much quicker than the body of the design, with the possibility of overheating the enamel. If both sides of the article are to be enameled, the back should be done first, as small points will show where the project was supported while firing the second side.

Copper and silver are the most satisfactory metals for enameling in the school shop. Their melting point is above the fusing point of the enamel (about 1500 deg. F.) and they are easily formed.

Equipment

1. Source of heat. Kiln, or gas furnace such as a melting furnace, gas torch, or, for very small pieces, a bunsen burner.

2. Iron mesh screen for holding pieces when firing.

3. Tongs.

4. Fine mesh screen or piece of nylon hosiery for sifting the enamel onto the design.

5. Small spatula made from wire flattened on the end for packing and arranging the design.

6. Tweezers or small paint brush.

Materials

1. Bright dip for cleaning the metal. One part sulphuric acid to ten parts of water.

CAUTION: add the acid to the water to avoid violent reaction.

2. Gum arabic or gum tragacanth. This may be obtained in most drugstores. Mixed at the proportion of one ounce to one quart of water. Used to hold the enamels in place for handling and firing.

3. Enamels may be transparent or opaque. They are available in a wide variety of colors in powder, chip, or thread form. The chips and threads may be broken as desired for the design.

4. Flux. A colorless enamel used as a base for the transparent enamels. May also be used as part of the design without covering if desired. In general the opaque enamels do not require fluxing.

Procedure

1. Prepare the piece for enameling.

a) Do all shaping, drilling, smoothing of edges, etc., required of the finished article.

b) If a stud or finding is to be attached to the finished project, it may be soldered at this point. A hard silver solder is used as the melting point of the solder must be above that of the enamel. Findings may be satisfactorily attached with a good all purpose cement or liquid solder after the enameling has been done.

c) Clean the metal in the bright dip solution. Rinse in water and polish with steel wool if necessary.

2. Dip the article in the gum solution. Only a very fine film of the solution is required.

3. Place the article on a sheet of paper and sift the enamel over the area to be covered.

a) If the piece is to be fluxed, the flux, rather than enamel, will be applied in the above manner. After the flux and gum solution has thoroughly dried, the piece will be fired, cooled, cleaned again, and enamel added.

b) After one color of enamel has been sifted in place the residue on the paper should be salvaged before proceeding with the other colors.

c) If chips or thread designs are to be added they may be placed in position at this time. The tweezers or small brush will be helpful in this operation.

4. Set the article aside to dry thoroughly. If fired when wet the gum solution will bubble, leaving pits in the enamel.

5. Place on the iron mesh screen and fire. If a kiln is used the process will require three to four minutes. If an open flame is used the time will vary according to the intensity of the heat and the size of the piece. Be sure to heat from the bottom if open flame is used.

a) Regardless of the type of heat the time of firing is best governed by watching the action of the enamel. When it melts and flows freely over the surface it is properly fired. Remove and allow to cool very slowly. Too rapid cooling will cause cracks and checks.

6. When cool, clean in the bright dip solution again. If more colors are to be added, repeat the above steps as though it were a new piece.

7. Rough edges may be smoothed with a carborundum stone.

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Rose, Augustus, *Enameling*, Metalcrafts Supply Co., Providence, R. I.

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C. R. Hill Co., 35 W. Grand River, Detroit, Mich.

DUCTILE IRON IN THE SCHOOL SHOP

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A Miracle Metal That Bends and Bounces

This new and curious cast metal, according to leading metallurgists, is the first outstanding foundry discovery in over a century. The technical name is spheroidal graphite iron, but it is commonly called ductile iron.

It is so ductile that it can *bend, bounce,* or *twist* without fracturing; yet, this wonder material has superior qualities of strength. For example, at a demonstration at The International Nickel Company's research laboratory at Bayonne, N. J., a gray iron trivet was dropped from a height of 5 ft. on a 1¾-in. marble slab. The trivet broke into five pieces under the impact. A ductile iron trivet, dropped from the same distance on the same slab broke the marble slab both with and against the grain. The ductile iron trivet was undamaged.

Already, research engineers list over 500 established and 200 experimental uses for ductile iron. These products range in weight from a few ounces to 50 tons and in size from 1/10 in. to 48 in. anvil blocks.

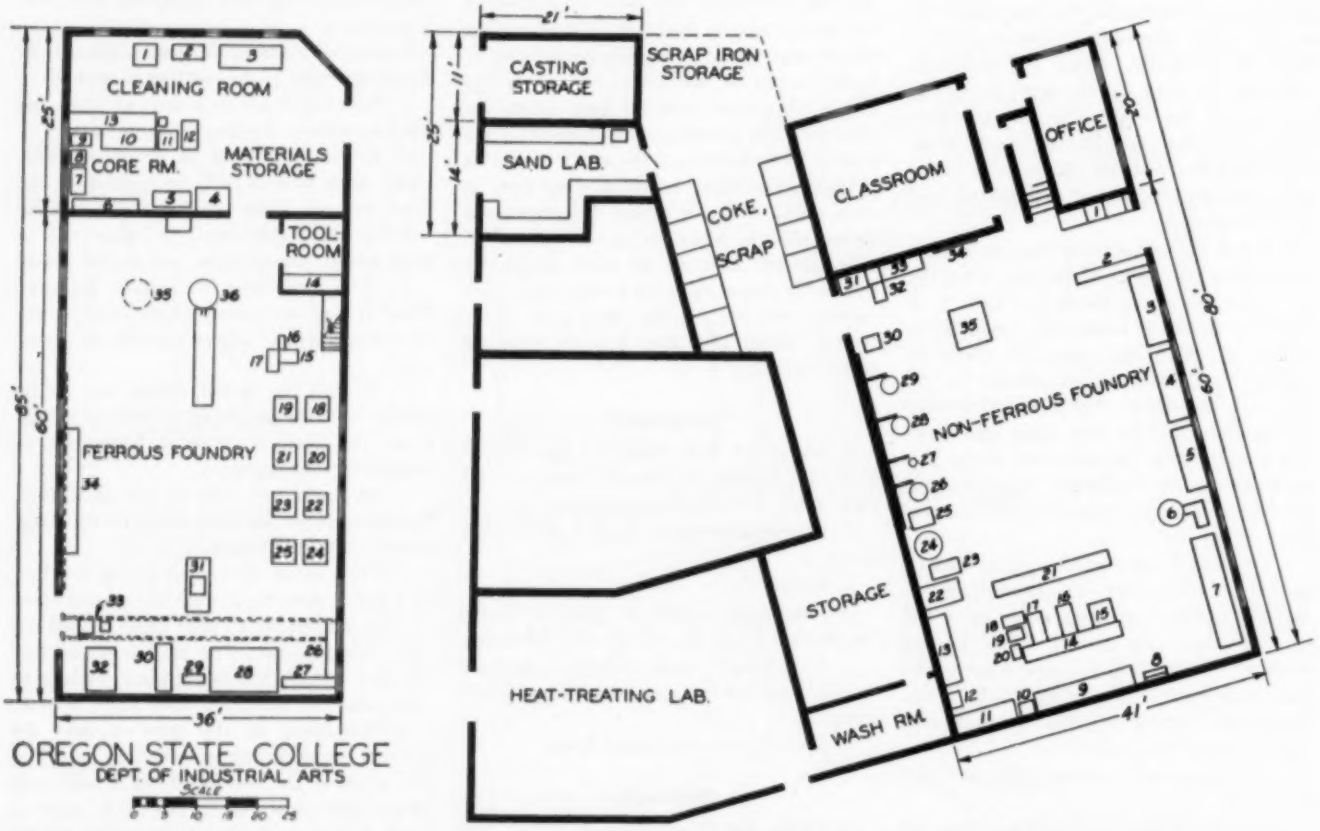
Evolution of Ductile Iron

Ordinary cast iron, or gray iron, has been used for 2000 and more years. But its usefulness has always been limited. It is brittle and fragile. Here is the reason. The graphite, or uncombined carbon in gray iron forms a network of long random flakes that weaken and embrittle the structure. Once, kitchen utensils, toys, hardware, and other cast iron items were popular. Gradually, superior metals replaced these iron castings.

Years and years later, malleable iron was developed. That was in the early eighteenth century. Malleable iron represented a tremendous advance; it has improved strength and ductility over gray cast iron.

A century ago, more than half of all the metal articles produced were products of the foundry. Columns for building construction, household utensils, heavy armament, and hundreds of varied products were all made in the foundry. Today, only about 15 per cent of all metals produced find their way into cast products. The reason is simple. During the past few decades new materials such as aluminum, magnesium, and plastics were introduced. New methods of fabrication like welding were perfected. And new ways of shaping steel were discovered.

But the foundry experts were not asleep.



FLOOR PLAN — FERROUS FOUNDRY (at left)

1. Oblique tumbler; 2. grinder; 3. barrel tumbler; 4. electric core oven; 5. gas core oven; 6. core storage shelves; 7. stock core extruder; 8. core stripper; 9. core blower; 10. coremaking bench; 11. core sandbin; 12. core sand mixer; 13. cleaning workbench; 14. pattern shelves; 15. sink; 16. instrument board; 17. desk; 18. Osborn jolt squeeze; 19. sand hopper; 20. jolt squeeze machine; 21. sand hopper; 22. jolt rollover; 23. sand hopper; 24. jolt machine; 25. sand hopper; 26. equipment shelves; 27. equipment shelves; 28. sand muller; 29. sand elevator; 30. blower; 31. shakeout pit; 32. flask storage; 33. crane; 34. flask storage; 35 proposed electric furnace; 36. cupola.

FLOOR PLAN — NON-FERROUS FOUNDRY (at right)

1. Sink; 2. equipment shelves; 3. sand bin; 4. sand bin; 5. magnesium sand bin; 6. sand muller; 7. sand-blast machine; 8. grinder; 9. polishing bench; 10. sink; 11. investment casting bench; 12. vacuum pump; 13. cabinet; 14. workbench; 15. arc-welding booth; 16. lathe workbench; 17. lathe; 18. small drill press; 19. drill press; 20. grinder; 21. flask storage; 22. centrifugal caster; 23. perm. mold machine; 24. electric furnace; 25. gas oven; 26. magnesium gas furnace; 27. gas furnace; 28. gas furnace; 29. gas furnace; 30. blower; 31. desk; 32. scales; 33. metal storage cabinet; 34. furnace tool rack; 35. slag pit.

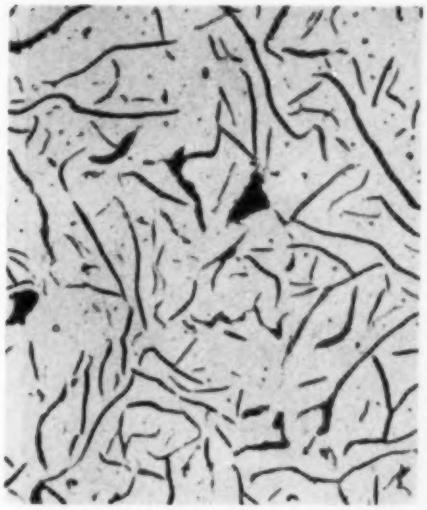


Fig. 2. Graphite, or uncombined carbon in gray cast iron, is in the form of long and random flakes. This forms a network that weakens and embrittles the structure

They were very much aware that all these factors contributed to the increased competition. So they shifted their research departments into high gear and bore down on the throttle.

In 1948 The International Nickel Company won the race and came up with the $64.50 answer — ductile iron. Most experts in this field claim that this new miracle metal will make the foundry more important than ever before.

Within one year, over 3500 melt tons of ductile iron castings were produced. By the end of 1952, this had skyrocketed to 100,000 tons.

Bridging the Gap Between Gray Iron and Cast Steel

Basically, ductile iron is nothing more than gray iron with a small amount of magnesium and, usually, 1 per cent nickel added. Sometimes, the nickel content is increased to 3.5 per cent. The magnesium, introduced to the molten metal just before pouring, produces a material that bridges the gap between gray iron and cast steel. And in many ways, it is a *superior* material.

In comparison, ductile iron has all the casting advantages of gray iron and a greater combination of strength and ductility than malleable iron. This is the reason. The graphite (uncombined carbon) present in ductile iron is collected in spheroidal deposits, whereas in gray iron the carbon is in long and random flakes. This forms a network that weakens and embrittles the structure. In malleable iron, the graphite is nodular, consisting of irregular masses of aggregated graphite flakes.

Ductile Iron in the School Shop

Realizing the diversified characteristics as well as the world-wide attention focused on ductile iron, Professor George B. Cox, head, Department of Industrial Engineering and Industrial Arts at Oregon State College, and James W. Smith, assistant professor, in charge of instruction in cast metals work, introduced this new material into the program.

That was 1949 — less than one year after The International Nickel Company announced the process. Since then Professor Smith figures his students have made hundreds of ductile iron castings. All of this work has been on an experimental and research basis. None is commercial.

Schools and colleges equipped with iron foundries can enrich their programs by adding ductile iron and with no increase in costs. Ductile iron can be produced in the same cupola that is used for gray iron and malleable iron. Possibly, the school may have to add two items of equipment. An additional ladle (2 all total) is required and a method of weighing (such as heavy-duty scales) to weigh the ladle of molten metal so that the proper proportion of magnesium can be added.

In addition, a wide variety of materials can be used for the base metal. This makes its compositional limits broad. Ductile iron is responsive to annealing and hardening treatments which produce a broad range of properties. Simple heat treatment for about eight hours greatly increases the ductility.

It is necessary for industry to obtain a license from The International Nickel Company to produce ductile iron and pay a royalty on the number of tons produced. Schools and colleges, however, can produce ductile iron on an experimental basis without payment of fees providing there is no commercial use going to be made of the products.

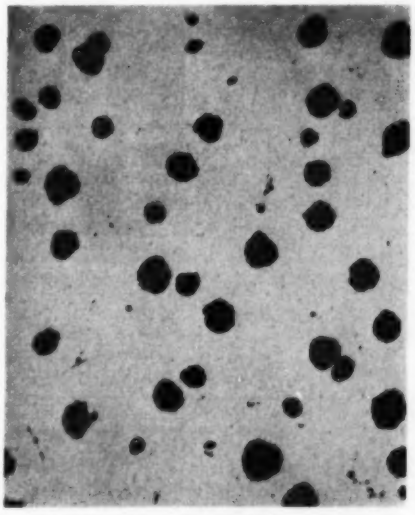


Fig. 4. The graphite in ductile iron is spheroidal in shape

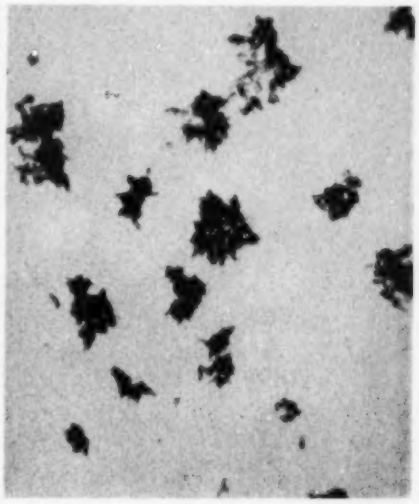


Fig. 3. In malleable iron, the graphite (carbon) is nodular consisting of irregular masses of aggregated graphite flakes

The benefit from the experimental pieces of ductile iron produced in the school shop is not limited to the foundry students. As mentioned in the next section, these castings can be welded and machined. Thus, many students will gain firsthand experience while working this relatively new metal through several important industrial processes.

Ductile Iron in the Industrial World

Already, a list of 500 established uses of ductile iron that ranges from A through Y without missing a letter has been claimed by experts in the field. To mention just a few, these were picked at random from a larger list.

anvils for forging hammers
auto crankshafts
bearings, for rolls in rolling mill
bed bars for lawn mowers
brake drums for drag lines
car wheels (streetcar)
diesel crankshaft
engine blocks, "V" type
flywheels for auto
furnace grates
gears for printing presses, washing machines, paper machines, road rollers, etc.
hand tool parts
handles (T) for valves
ingot molds
journal bearings
kettles for lead
levers, high speed for shoe machinery, subject to sudden shock
marine fittings — where no welding required
nuts for head of gyratory crusher
ore bridge wheels

Fig. 5 (at left) The preheated receiving ladle is being transferred to the scale at the cupola spout
Fig. 6 (at right) Student (left) with an optical pyrometer is checking the metal temperature while the casting is being poured

(See Figure 7 which is used as cover cut this month)

pistons 14 in. dia. by 5 ft. long, weight 1400 lb.
plow shares
presses, hydraulic straightening
rolling mill housings — 500 lb.
sand hopper (high internal pneumatic pressure)
thread guides (30 per cent cost reduction)
truck engine crankshafts
unloader valve bodies
vacuum cleaner parts
wheels for streetcar

In addition, bulldozer blades, motorcycle flywheels, propeller parts, railroad car wheels, and 196 other ductile iron items are in the experimental process at the present time.

One potential market is crankshafts. Ductile iron producers expect to capture a fair proportion of this market because their products with the same fatigue resistance factors offer better wearing quality. Besides, they claim that these ductile iron crankshafts can be produced at less cost.

One unusual feature is production of complex shapes. Designs that have lain dormant for years because they were too intricate in detail are now successfully cast with this new material.

This "bouncing" metal withstands shock loads well. Thousands of plow shares have borne this out. Farmers find that ductile iron shares last ⅔ longer than the conventional steel plowshares. A lot of further experimentation is carried out on bulldozer blades, roadworking, and other earth-moving machinery.

By following the established techniques used for welding gray iron, ductile iron can be readily arc welded. One of the better electrodes consists of a nickel core wire with a carboniferous coating similar to Ni Rod "55." Ductile iron can be welded to steel, highly alloyed materials, and to ductile iron itself. And further, joints welded in ductile iron pipe without preheat or postheat have proved stronger than the pipe itself under hydrostatic tests.

In several concerns, ductile iron is being used solely because of its weldability. For example, one concern welds a steel pipe to a ductile iron clevis.

The machinability of ductile iron in the annealed condition is phenomenal. Cutting speeds up to 900 feet per minute can be used. Thus, in some industries the output of each machine can be doubled and sometimes trippled. Looking at this from another viewpoint, it means that the same production can be maintained with fewer machines and operators.

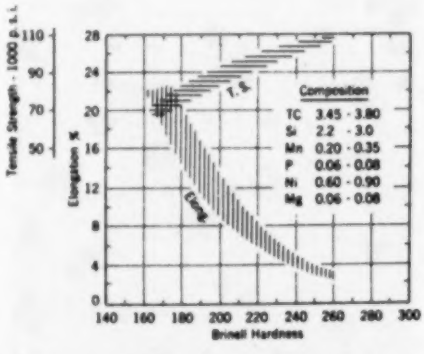


Fig. 8. Relation between tensile strength, elongation, and hardness of ductile iron
— Courtesy of The International Nickel Company

Conclusions

It has often been said that the shortest and most economical route between raw materials and finished products is through the foundry. And ductile iron is helping to make this possible. Take, for example, the large shafts used as beaters to produce wood pulp. These are usually forgings. A large manufacturing savings resulted when one was made as a single ductile iron casting. Savings like this will probably place ductile iron high among the more important metals.

MAGAZINE STAND

FRANK M. CLEMONS
Industrial Arts Instructor
Churchland High School
Portsmouth, Va.

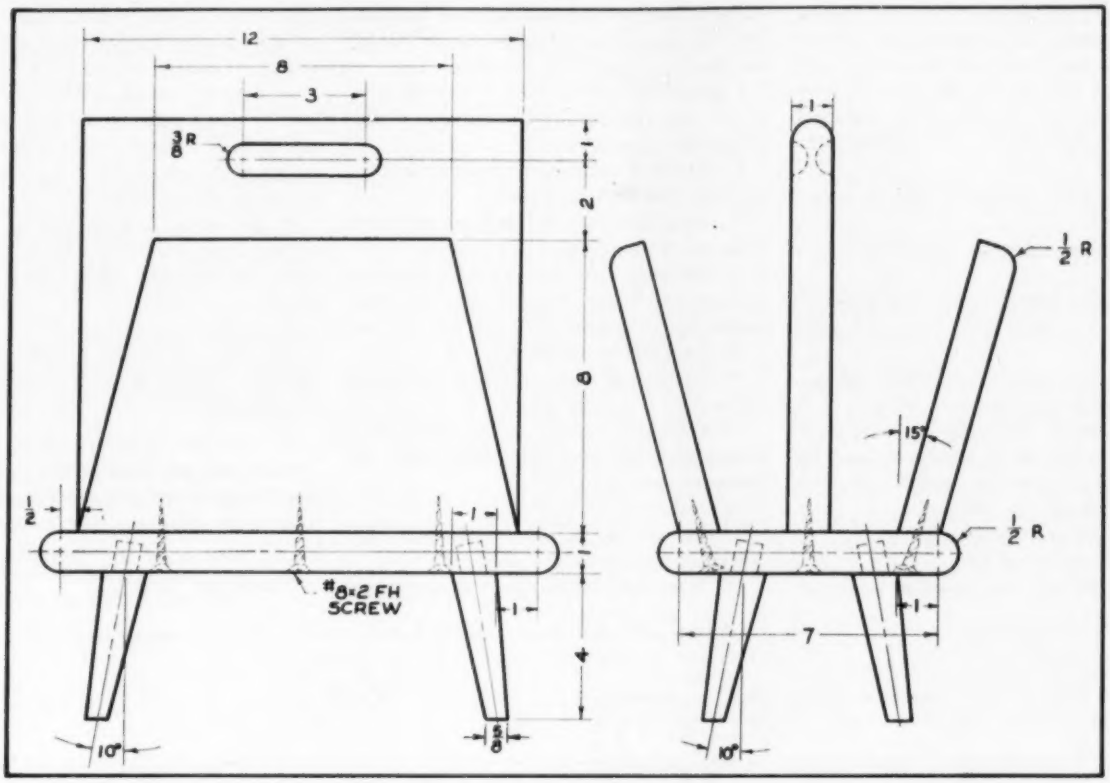
Sturdy and practical, this modern magazine stand performs well the function it was meant to perform. Designed as a classroom project, it offers a simple problem for beginners in woodworking and gives a piece of furniture which conforms to modern design requirements.

BILL OF MATERIALS

No. of Pcs.	*Part*	*Material*	*Size*
2	Sides	Mahogany	1 x 8 x 12
1	Center partition	Mahogany	1 x 11 x 12
1	Bottom	Mahogany	1 x 8 x 14
4	Legs	Mahogany	1 x 1 x 5
9		Flat head screws	No. 8 x 2

Procedure

1. Lay out and saw stock to size.



Details of magazine stand

2. Using router, shape edges on all parts, as shown.
3. Sand all parts smooth.
4. Turn legs on lathe.
5. Sand legs.
6. Cut proper angle on shoulders of legs.
7. Bore holes for legs in bottom. (Use a piece of waste stock clamped to drill stand to give tilt to bottom of stand. Marks on bottom of stock should be aligned with drill from a determined point on the waste stock. Careful alignment must be made from each of the four corners of the bottom to assure the correct angle for all legs.)
8. Drill pilot holes for screws.
9. Mark and drill anchor holes.
10. Apply glue to joining edges and fasten screws.
11. Apply glue to legs and insert and seat in holes provided. (No clamping will be necessary if a good fit is made.)
12. Remove traces of glue and resand entire project with 5/0 paper.

Procedure for Light Finish

1. Apply white filler.
2. Seal with lacquer sealer or clear shellac.
3. Brush with an even coat of thin white lacquer. (Proportions: 1 part lacquer, 5 parts thinner.)
4. Seal with lacquer sealer or shellac.
5. Apply three coats of clear lacquer.
6. Finish by rubbing with wet-dry paper, 400-A. Use plenty of water while rubbing.

Use manufacturer's schedule for drying time between finishing operations.

Magazine stand

SMALL OCCASIONAL TABLE

F. J. CLARKE
Central State College
Edmond, Okla.

The small occasional table illustrated here shows an interesting variation from the more usual arrangements of legs and rails. It is of sound construction and can be fairly claimed to be of pleasing appearance. It makes an excellent project for the student who has mastered to some extent the use of his tools and who is keen to show his mettle by tackling something which will thoroughly test his abilities and at the same time provide him with a most useful and attractive piece of furniture.

The construction involves the making of two flat frames, the joint used being the through mortise-and-tenon joint which should be wedged as shown in Figure 1. The upper and lower cross rails of each frame are halved into each other. The top is attached to the upper rails by eight or more wooden buttons which while holding it secure and flat, enable it to move as shrinkage and expansion demand.

All shaping of legs and rails must be done before the frames are glued together, as also must be the shallow mortises in the top rails which are to hold the buttons.

Many variations are possible in the shaping of the feet and in the treatment of the edge of the table top. As always, the careful consideration of the details of shape and form and decoration is of paramount importance if a truly pleasing and satisfying object is to be produced.

The table looks particularly well in walnut or oak.

The following suggested procedure may be of interest:

1. Select and prepare wood to size for the legs and rails. Mark face sides and edges clearly.

2. Mark out positions of tenons on legs and mortises in rails. Be very careful to mark each joint clearly with letters or numbers so that there is no risk of confusion later on. Use the rail and leg first marked as masters when marking out the others.

3. Mark out cross halving joints.

4. Cut all joints and fit.

5. Make two saw cuts in each tenon to take wedges. Note position and depth of saw cut.

6. Cut about twenty wedges, preferably of the same wood used for the table.

7. Mark out positions of button mortises in top rails, making sure that they are placed alternately on each rail.

8. Cut mortises. Note that depth need be no more than one quarter inch.

9. Shape ends of lower and top rails and underside of lower rails.

10. Assemble and be sure that: (*a*) all surfaces are flush; (*b*) all angles are right angles; (*c*) frames are flat and out of wind.

11. Sand lightly if necessary.

12. Chamfer all edges with chisel and spokeshave. Note that chamfers must not be sanded.

13. Glue table together, wedging joints after having made sure that each frame is flat, and that angles are correct.

14. Make up the top.

15. Cut the top to shape and finish edge according to taste.

16. Make eight buttons from same wood as table. Note direction of grain and slanting top surface of each button which enables pressure to be exerted on top when screwed on.

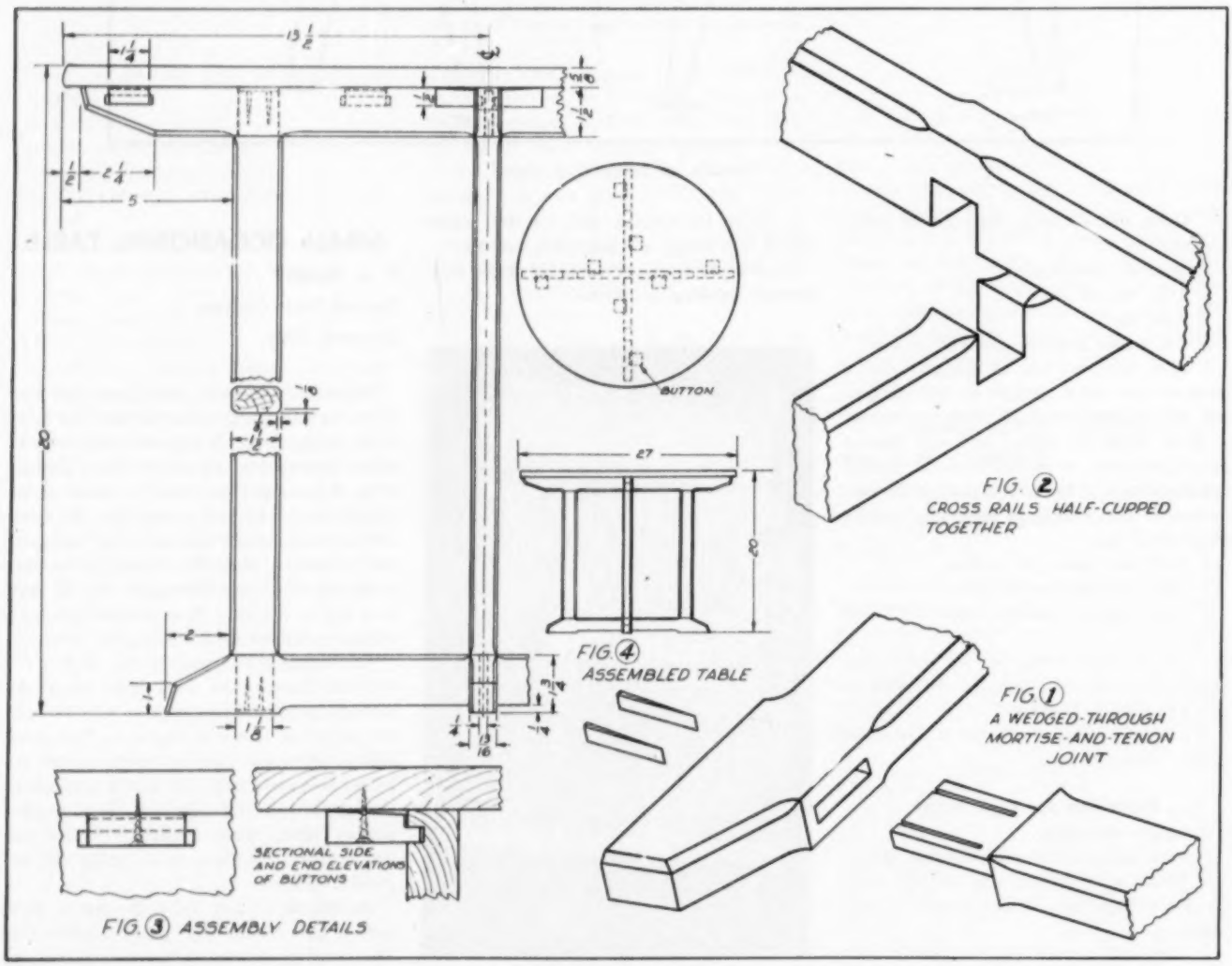
17. Remove surplus glue from underframe. Saw off protruding wedges and ensure that end of each tenon is cut a little below the surface of its rail so that if the latter shrinks, the tenon will not stand out.

18. Set top face downward on a smooth surface. Place buttons in mortises and arrange frame symmetrically. Clamp down by pulling up the screw firmly.

19. Polish.

This table was made by Mr. Jackson, a freshman student of Central State College, Edmond, Okla.

More dirt has been moved to bury pipe lines, most of which carry oil or its products, than that required to dig all the canals used since the beginning of time. — *Petroleum Newsnotes*


BUTTON
SECTIONAL SIDE AND END ELEVATIONS OF BUTTONS
FIG. 3 ASSEMBLY DETAILS
FIG. 4 ASSEMBLED TABLE
FIG. 2 CROSS RAILS HALF-CUPPED TOGETHER
FIG. 1 A WEDGED-THROUGH MORTISE-AND-TENON JOINT

Small occasional table

A UNIQUE LAMP FIXTURE

RONALD NUTTER
Instructor of Industrial Arts
Passaic, N. J.

During the past few years with more and more private homes being built, curiosity has been aroused among both students and their parents as to what types and periods of decorations, fixtures, and furniture to use in furnishing the home.

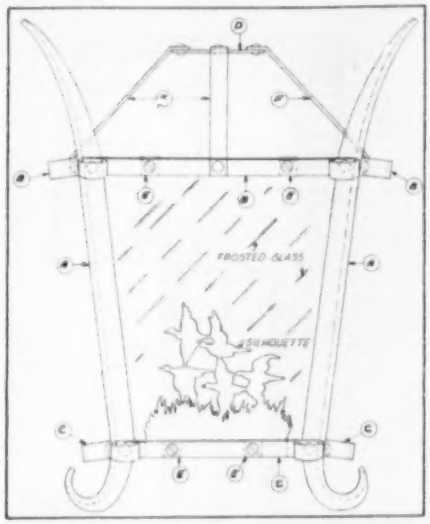
The lamp fixture described here is the result of a study, made by students who wanted to make a lamp fixture that would be suitable as a drop, for the hall or porch, that would fit into the modern home of today.

This project offers an excellent opportunity for the advanced student in art metal, a chance to apply many of the basic skills and operations taught in the general shop.

The student cuts all pieces (see detail drawing) as listed in the bill of material.

BILL OF MATERIAL

No. of Pcs.	Name of Part	Size
4	*A* Corner posts	½ x ½ x ⅛ angle iron
4	*B* Top bars	1/16 x ⅜ x 8½ mild steel
4	*C* Bottom bars	1/16 x ⅜ x 7 mild steel
1	*D* Socket support	16-ga. x 2 x 2-in. sheet steel
16	*E* Glass clips	24-ga. x ⅜ x 1-in. sheet steel
4	*F* Supports	1/16 x ⅜ x 3¼ mild steel
4	Pieces of glass	6 x 6
16	R.h. machine screws	No. 9/32 x ¼
4	Silhouettes	24-ga. sheet steel

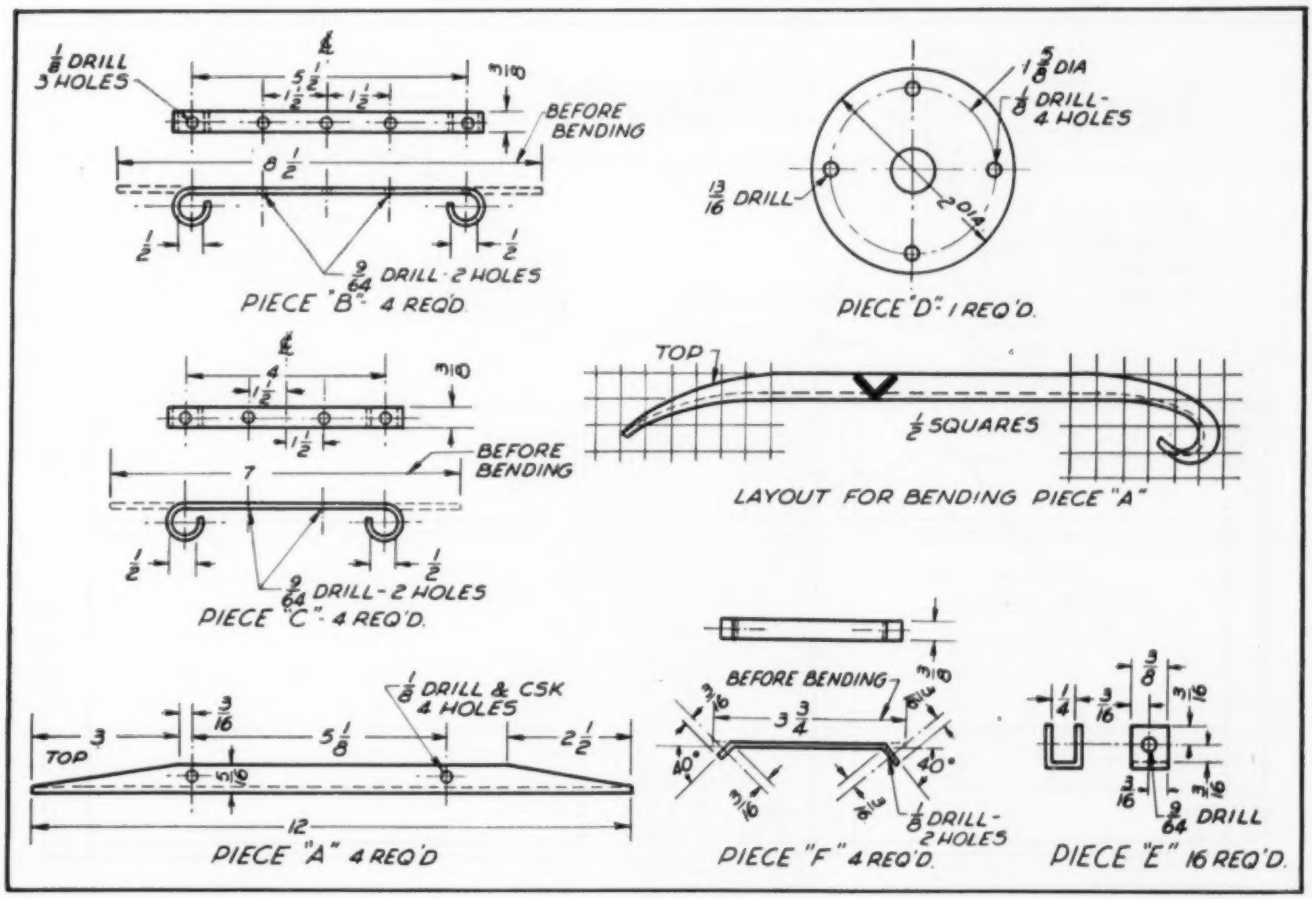


Lamp fixture assembly

When all pieces have been formed, all drilling and countersinking operations finished, start to assemble one frame at a time using ⅛ x ¼ round head iron rivets. I have found that by the use of jigs and templates, many operations can be speeded up, thus demonstrating to the student some of the methods used in industry.

Paint all of the iron work flat black which gives a pleasing effect when used with the silhouettes. The silhouettes may be of any object that the student desires; nature, wild life, and fiction characters are examples.

The frosted pieces of glass are ordinary window glass cut to fit inside of the corner posts. Fine emery dust and water placed between two pieces, working in a circular motion on a flat surface, an even frosted surface will appear in a few minutes. The glass is held in place with the clips, fastened to the frame with 6–32 round head machine screws and



Details of lamp fixture

nuts. The bottom clips also hold the silhouettes in place.

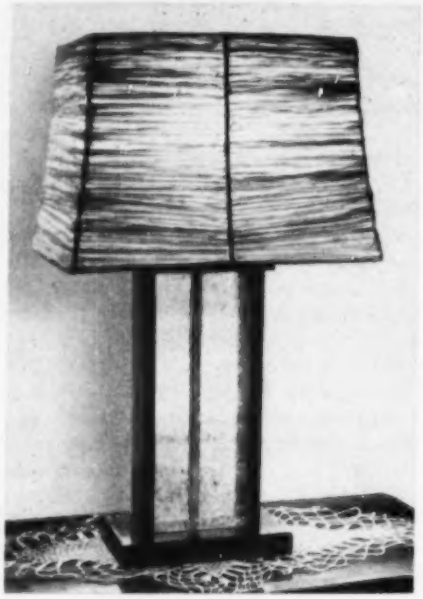
A search around the home and electrical shops will turn up inexpensive chain and ceiling supports to use with the lamp. With a few changes this lamp can be adapted for a post or outside lantern as well.

CONSERVA LAMP

DELBERT A. DYKE
Professor of Industrial Education
Sul Ross State College
Alpine, Tex.

Small pieces are an unavoidable product of the woodworking areas. Most shops have an area for storing pieces found on the floor and around machines at the close of the period that no one wants or can see any immediate need for in the problem under construction at the time. This area soon fills beyond capacity and a careful selection is necessary to avoid disposing of pieces that have value as parts of future projects.

It is a skillful instructor who can guide his students into the selection of a problem utilizing quantities of the small pieces. In shops where a great deal of freedom is permitted in the selection of materials, it is an even more difficult task to train students to check the small piece storage area before cutting from long stock. Teaching conservation of materials has always been recognized as worthy of attention.

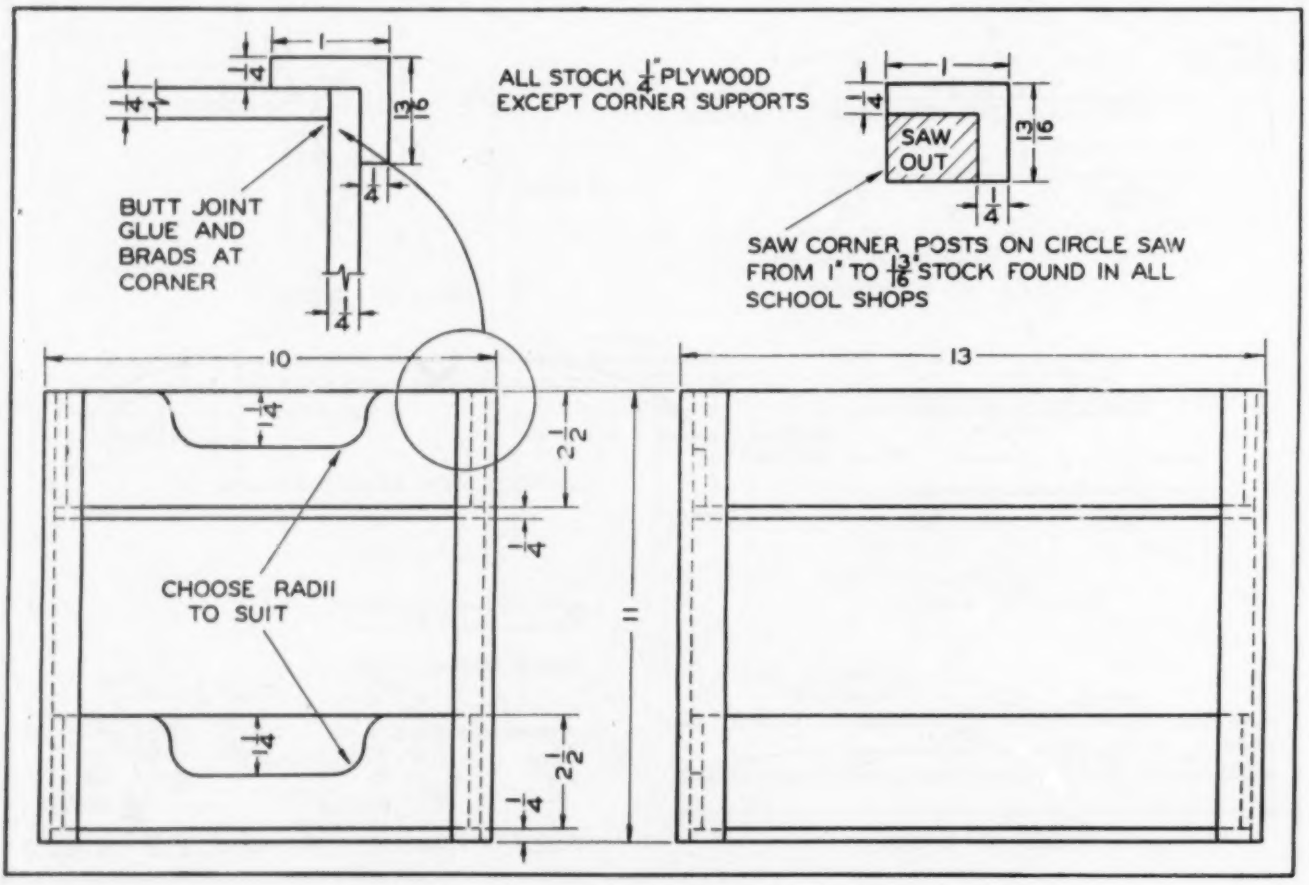


The conserva lamp

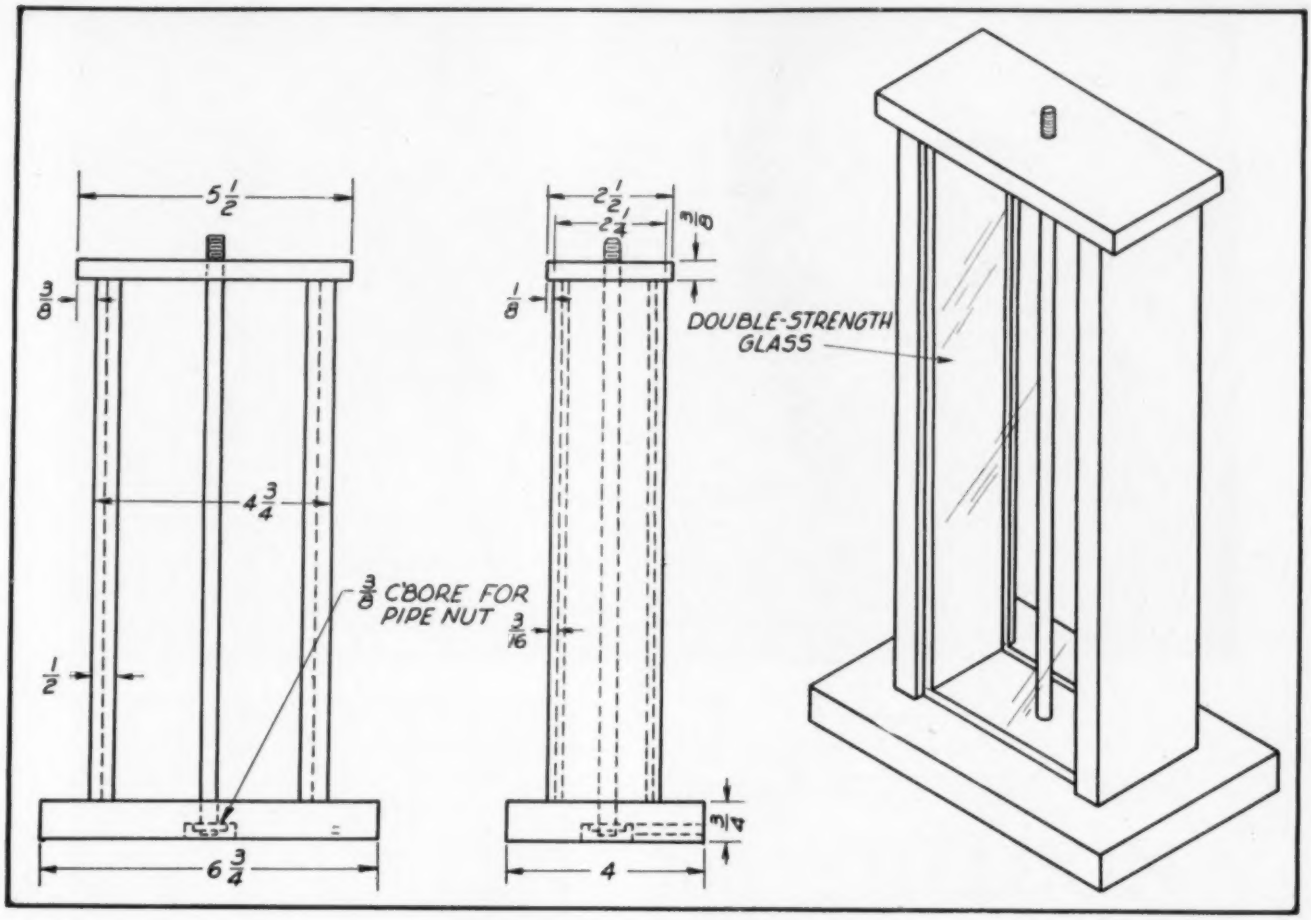
The project described in the accompanying article has served as a point of departure for many articles made from small pieces partly or entirely. There have been many improvements and changes in the original shown in the photograph. Changing the construction to eliminate the ⅛-in. pipe was probably one of the earliest.

This particular project encompasses many of the desired experiences in an elementary course. Use of the basic tool processes includes layout, sawing to rough size, planning and squaring stock, cutting and decorating glass, drilling, fastening with screws, sanding, finishing, threading a pipe, and wiring a lamp.

To further the cause of conservation and using materials readily available in every community, the shade frame was made from clothes hangers. This brought in the valuable experience of hard soldering or brazing. Part of the satisfaction in making a lamp or any other project comes to the student who boasts he made it himself — all of it. The natural-



Desk mail basket by Louis Barocci, High School, Cudahy, Wis.



Details of the conserva lamp

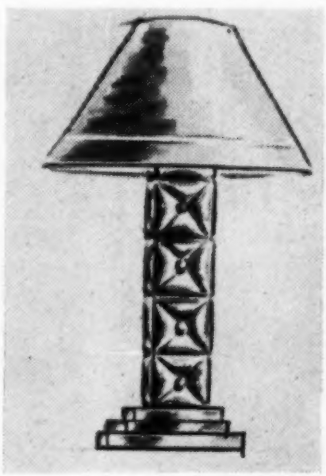
colored raffia made a shade that blended harmoniously with the rich brown tones of the walnut used in the lamp base.

The glass panels were given a single coat of "Crystal Cote" finish. Panels of other materials have been used quite effectively. Among the other materials used were tooled and carved leather, carved wood or plastics, and tooled metal foil.

Parts of the human skull may be replaced by molded-in-place plates made of an acrylic plastic called pentocryl, if methods used recently at the Mayo Clinic prove successful. Early trials with the substance, which is petroleum-derived, brought good results. The plastic, also used for making dental plates, is mixed as a paste, poured into place and molded with the fingers to the desired size and shape. Petroleum and its derivatives form a versatile array of ingredients for medical and surgical uses. — *Petroleum Newsnotes.*

CHELSEA VOCATIONAL MAKES LAMPS FOR RED CROSS

(Continued from page 260)



Plastic lamps for Red Cross

producing other salable items. Shortly the Red Cross again will make their annual visit, and Chelsea Vocational High School will be prepared to show them many new items of interest to make life at veterans' hospitals more pleasant.

Dektufts and information about this product may be obtained by writing to *Jaydon, Inc., 482 Broome St., New York 13, N. Y.*

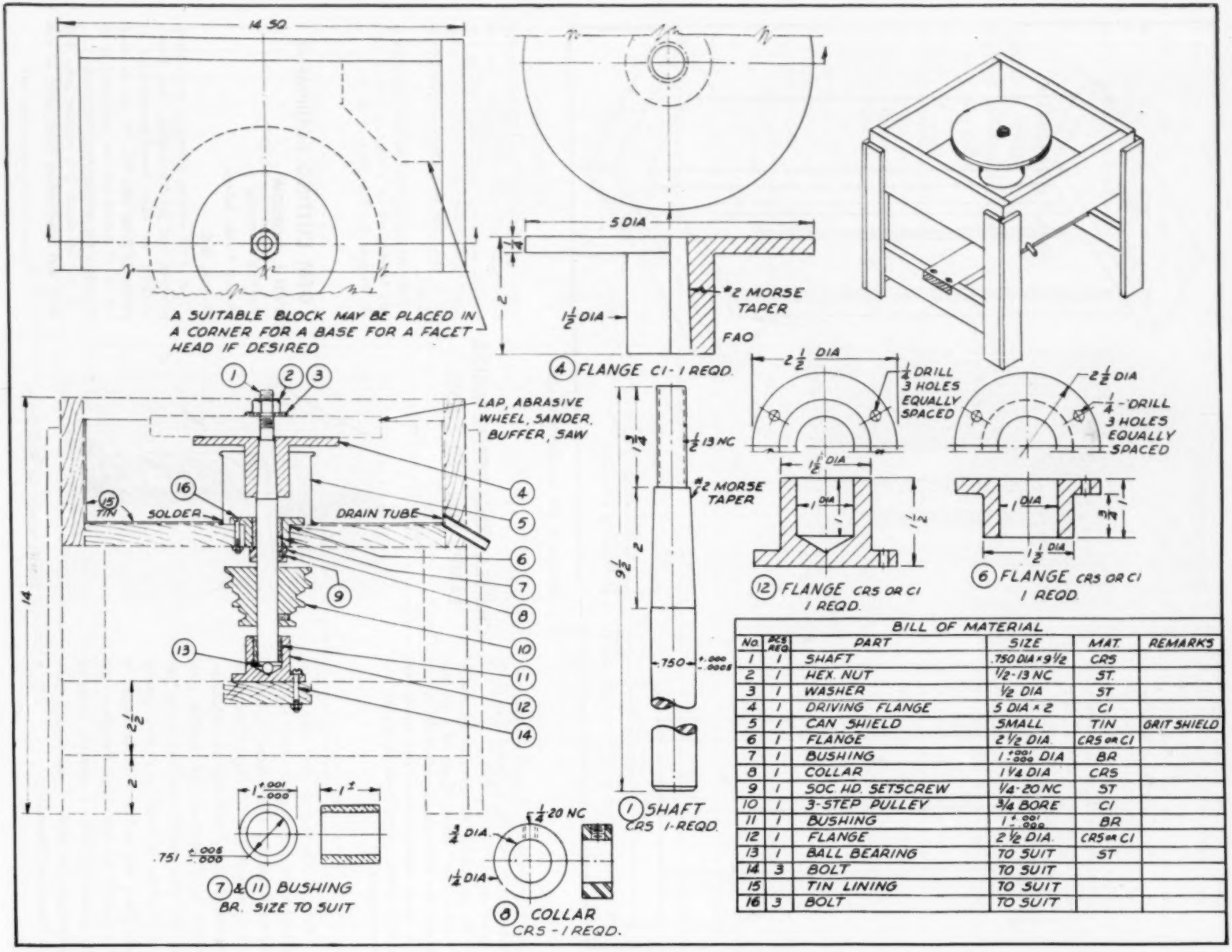
GEM CUTTING EQUIPMENT

IRVIN L. MORROW
Drafting Instructor
Muncie Trade School
Muncie, Ind.

Due to the growing interest in gem cutting, polishing, and jewelry making (Ben Hunt's articles), we have been experimenting in equipment along this line. We get as much fun out of making our own equipment as we do making the semiprecious gem stones.

If one has access to a machine lathe, drill press, and woodworking hand tools, he can

(Continued on next page and page 24A)



BILL OF MATERIAL					
No.	PCS REQ.	PART	SIZE	MAT.	REMARKS
1	1	SHAFT	.750 DIA × 9½	CRS	
2	1	HEX. NUT	½-13 NC	ST.	
3	1	WASHER	½ DIA	ST	
4	1	DRIVING FLANGE	5 DIA × 2	CI	
5	1	CAN SHIELD	SMALL	TIN	GRIT SHIELD
6	1	FLANGE	2½ DIA	CRS OR CI	
7	1	BUSHING	1 +.001 -.000 DIA	BR	
8	1	COLLAR	1¼ DIA	CRS	
9	1	SOC. HD. SETSCREW	¼-20 NC	ST	
10	1	3-STEP PULLEY	¾ BORE	CI	
11	1	BUSHING	1 +.001 -.000	BR	
12	1	FLANGE	2½ DIA.	CRS OR CI	
13	1	BALL BEARING	TO SUIT	ST	
14	3	BOLT	TO SUIT		
15		TIN LINING	TO SUIT		
16	3	BOLT	TO SUIT		

Gem cutting equipment by Irvin L. Morrow

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MUSKEGON, MICHIGAN

SHELDON FURNITURE MEANS EDUCATIONALLY CORRECT

GEM CUTTING EQUIPMENT

(Continued from page 285)

make practically everything needed for this interesting field of work. Sizes in most cases are optional. Shaft size for pulley, bearings, taper, and ½-in. thread diameter for grinding wheel opening should be held to standard sizes.

All gem cutting operations can be performed on this box-type gem cutting equipment, even sawing and facet work with small modifications. For advanced and class group work, separate machines are more practical. Saws and grinding wheels should be purchased. The saws can be made, if desired.

To get best results on different stones, one has to experiment, trying different grinding, lapping, and polishing techniques, and making your own enables one to do this to a large degree. This vertical type may easily be adapted to a table top instead of a box.

We have also built horizontal type grinders; and made our own self-feeding diamond saw; sander head of pipe fittings; and a professional table type for lapping. Now we are making a faceting device for our shop.

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News Notes

♦ To better serve schools who maintain a policy of acquiring educational films on a purchase or lease basis, Walt Disney Productions recently announced a long-term lease plan. Subjects available under the plan (restricted to schools) are those films which have hitherto been available only on a rental basis through dealers.

Write to *Walt Disney Productions, Burbank, Calif.*

♦ The Eastman Kodak Company has announced a new edition of their booklet on picture taking indoors. They have retitled the new book *Snapshots Indoors*, and have brought it completely up to date.

Snapshots Indoors provides full data on picture taking with flash, flood, and natural light. It also offers specific suggestions for best results when picturing babies and young children, making family "action" photos, recording holiday activities, and producing attractive and interesting still-life studies.

Liberally illustrated with pictures and diagrams, the booklet is available through Kodak dealers for 25 cents per copy.

♦ A new traffic safety booklet, *Common Sense Pays Off*, which lists tips for safer driving and declares that "everyone should take an interest in the prevention of accidents," has been issued by the Association of Casualty and Surety Companies to stimulate interest of both youthful and adult drivers in safe driving practices.

The booklet may be obtained from the *Association, 60 John St., New York 38, N. Y.*

♦ Reynolds Metals Company publish an instructive sheet titled "Technical Advisor" which aims to present information on the latest methods for fabricating and processing aluminum and its alloys.

"Technical Advisor" 21 and 22 present a very instructive article on structural design which would be very useful to technical drafting courses.

For further information write to *Reynolds Metals Co., 2500 So. Third St., Louisville 1, Ky.*

♦ Western Michigan College is opening a new curriculum in automotive transportation.

The aim of this course is to train people to become automotive service managers, salesmen, and to fill various supervisory and administrative positions in the manufacturing phases.

This will be a four-year program, with majors in automotive and business, while minors will come in industrial supervision and economics or psychology.

♦ Association Films, national distributor of 16mm. sound motion pictures to schools, clubs, industrial plants, television stations, and other community organizations, announces publication of its thirty-ninth annual catalog, *Selected Motion Pictures*. More than 1400 subjects are described, including 140 industrially sponsored free-loan films.

The films are grouped under 22 category headings to assist teachers, industrial-relations directors, program chairmen, and others who use films in their programing. Among the categories are: agriculture, arts and crafts, geography, history, home economics, industry and manufacturing, social science, and entertainment.

For copies of *Selected Motion Pictures* write: *Association Films, 347 Madison Ave., New York 17, N. Y.*

(Continued on page 26A)

"Get 'em while they're HOT"

the NEWEST tool catalogs from America's oldest file maker — Heller!

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everything in top-quality hammers, trowels and farriers' tools.

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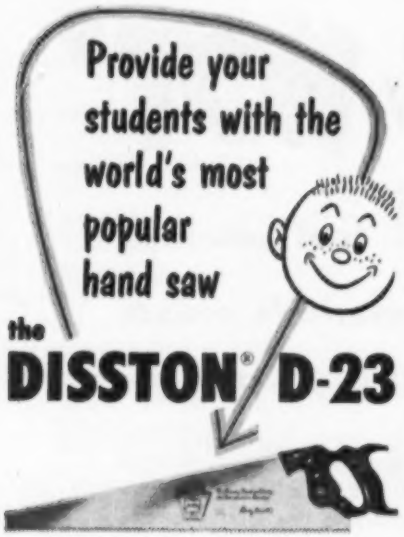
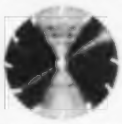


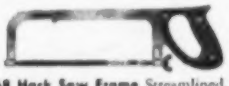
Here's a fine saw that will help any student do better work. It's the choice of *millions*—and no wonder! The famous Disston D-23 is made of Disston's own saw steel. It is true taper ground, accurately filed, carefully set, beautifully finished.

And there's a bonus to the school that chooses this fine saw—or any Disston tool! Disston saws and tools serve longer, need fewer replacements. Keep DISSTON in mind when you make your next requisition!

OTHER FINE TOOLS IN DISSTON'S COMPLETE LINE



D-3200 Deluxe Circular Saw A hollow-ground combination saw. One of a *complete* line of circular saws for all bench and portable machines.



No. 368 Hack Saw Frame Streamlined, efficient design, comfortable grip, rugged frame. Adjustable blade position.

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No. D-1-S Chisel Set High-carbon steel chisels and gouges, hardwood handles. The finest set of its kind ever offered.

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NEWS NOTES

(Continued from page 24A)

♦ Eight students and one of their instructors from the Instituto Tecnologica de Chihuahua, Chihuahua, Mexico, recently inspected facilities for conducting technological research and education at Technology Center in Chicago.

The students are in their senior year in industrial engineering at the Instituto. Their leader, Ing. Gustavo Alvarado Pier, is the Instituto's director. The group is touring the United States to observe industrial methods and procedures.

♦ The University of Idaho School of Education has been designated as a state counselor-training institution.

The university program on counselor training meets all standards set up by the federal office and has been approved by the U. S. Office of Education.

Under the counselor-training program students learn how to use the tools and techniques of vocational guidance. These include administering of tests, conducting case studies, making community surveys, the studying of and using of occupational information for the selection of vocations and professions, and the conducting of school guidance programs.

Students at the university may develop a major in this field at either the graduate or undergraduate level. — *George V. Radcliffe*

♦ A new pictorial chart shows the place of Leonardo da Vinci in the stream of history by illustrating the main events and works of his life in chronological relationship with other personalities and events of his time.

Horizontally, the chart is divided into three general sections. The center section has small reproductions of some of Leonardo's works, as well as pictures of the house where he was born and some of the buildings in which he lived or worked. Above this, important events of the period are noted, and below it are the names of some of Leonardo's outstanding contemporaries, as well as pictures of his four patrons and costumes of the day.

This study chart and a four-page mimeographed story of some of Leonardo's inventions and scientific studies may be obtained free by writing to the Department of Information, *International Business Machines Corp., 590 Madison Ave., New York 22, N. Y.*

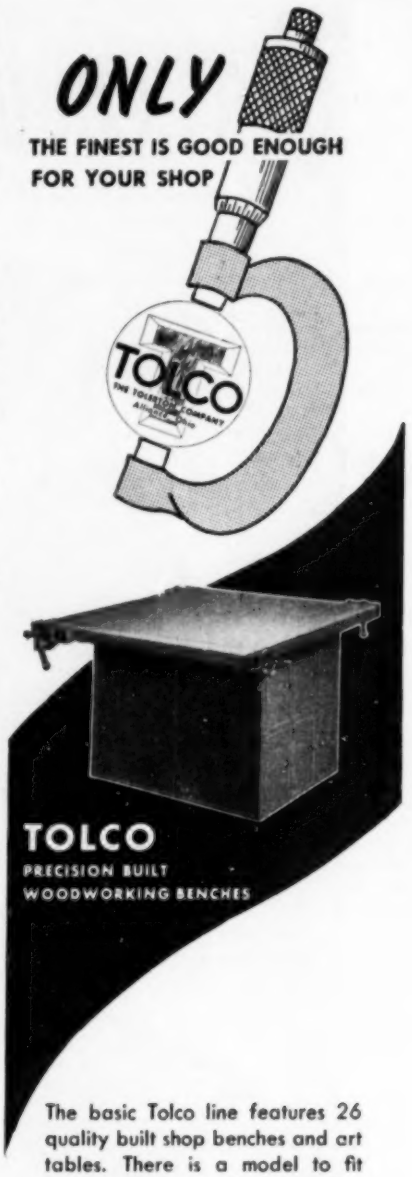
NEW NOTEBOOK ON UHF TELEVISION

Provides practical technical information on tuners, antenna performance, propagation characteristics, and data on converters.

A new notebook providing practical technical data on VHF-UHF tuners, UHF antenna performance, UHF propagation characteristics and UHF converters has been published by The Paul H. Wendel Publishing Co., Inc., of Indianapolis, Indiana.

The new notebook, Number 7 in the Television Technicians Lecture Bureau Series, was written by Edward M. Noll, author of *Television for Radiomen*, technical consultant and former instructor at Temple University.

The 72-page notebook contains over one hundred illustrations, including block diagrams, schematics, and photographs of components and circuit sections to supplement readily understandable text. The cost is $1. Write to *The Paul H.*



The basic Tolco line features 26 quality built shop benches and art tables. There is a model to fit every need and budget. The popular TM-12 four student woodworking bench shown has 2¼" hard maple, edge grained, electronically glued top. Base is constructed of heavy metal, has 12 lockers. Tolco products are built right today for thousands of abusive tomorrows. Why be satisfied with anything less than the finest? Write today for full color illustrated folder of the complete Tolco line.

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Established 1894 — Our 59th Year

Wendel Publishing Co., Inc., Post Office Box 1321, Indianapolis 6, Ind.

♦ Because the city of New York is still badly in need of shop teachers, the board of education has extended the liberalization of eligibility requirements until September 1, 1955. This means that candidates will be permitted to qualify for the competitive examination for license as teachers of shop subjects (trades) under the relaxed regulations in effect since March 1, 1951.

These permit applicants to qualify after a half year instead of the usual year of experience in teaching the subject.

The relaxed rules also permit applicants to complete, within three years from the usual date for meeting course requirements, 20 of the required 32 semester hours in approved teacher-training courses.

New Publications

Animal Glue in Industry

Prepared and published by the National Association of Glue Manufacturers, Inc., 55 West 42nd St., New York 18, N. Y. Cloth, 101 pp., 5½ by 8⅛ in. Paper copy available. Complimentary copies may be obtained by writing to the association.

This book was prepared as an educational service to industry.

In its six chapters it discusses the different types and grades of animal glue. Also the general properties, preparation for use, making it moisture resistant. The book also lists applications of this type of glue.

It also explains how animal glue is used as a sizing and coating agent in making cork compositions, printers' rollers, plaster castings, and sandblasting stencils.

Then it treats of the use of this glue as a colloid used in papermaking, water clarification, calcimine and water paints, etc.

With Focus on Family Living

By Muriel W. Brown. Office of Education Vocational Division Bulletin No. 249, Home Economics Education Series No. 28. 248 pp., 60 cents. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., 1953.

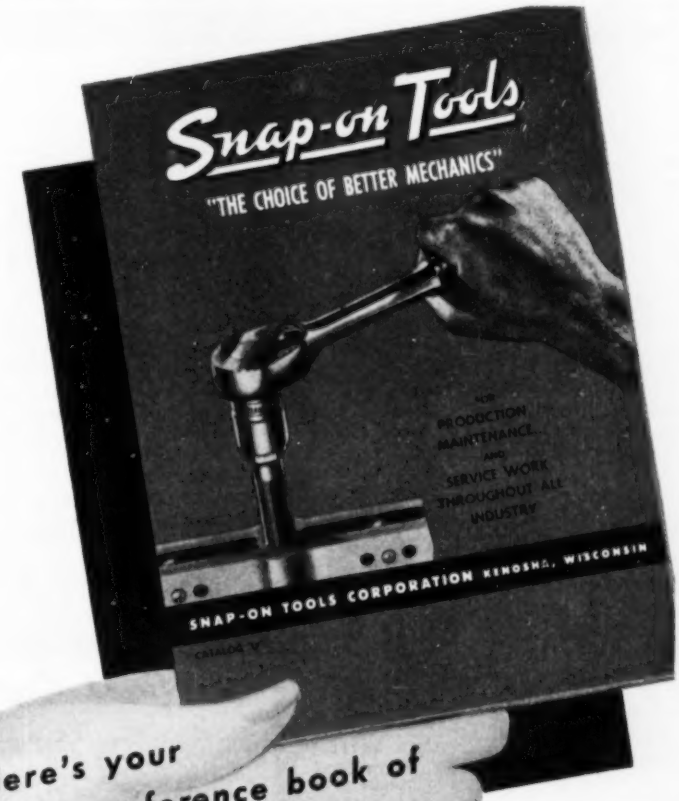
This is the story of four experiments in community organization for family life education. The publication contains outstanding examples of community co-operation. It should be helpful to school administrators, teachers, parents, and the many others interested in education for home and family living and in school-community co-operation.

Industrial Arts in California State Colleges

By Einar E. Siro, Chairman (mimeographed, printed cover, bound), iv + 64 pp., 8½ x 11 in., Division of State Colleges and Teacher Education, State Department of Education, Sacramento, Calif., 1951.

A study conducted for the California State Department of Education. The report covers the following: Introduction, Objectives of Industrial Arts Teacher Education in California State Colleges, Administrative Plans, Offerings and Facil-

(Continued on next page)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NEW PUBLICATIONS

(Continued from previous page)

ities in the Ten State Colleges, Supply of Industrial Arts Teachers, Expansion of Industrial Arts Programs, Improvement of Industrial Arts Teacher Education Programs, Recommendations, and Sample Individual Course Description Sheets.

Exploring Automechanics

By Harold T. Glenn. Cloth, 318 pp., 6⅜ by 9¼ in., illus., $3.96. Chas. A. Bennett Co., Inc., Peoria, Ill.

This book is a full, four-semester text for the high school auto shop. It offers both practical and theoretical automotive experiences.

It describes all the new improvements in automotive engineering and presents specific applications to numerous types of cars.

It also contains large added sections on safe driving, and information helpful in the purchasing of used cars.

The five sections into which the book is divided cover material on how to become a better automobile driver, an intelligent user of the automobile, how to gain an understanding of the operating principles of the auto engine, the electrical system and the chassis and drive mechanism.

Handbook for Conscientious Objectors

Central Committee for Conscientious Objectors, 102 pp., 35 cents. 2006 Walnut St., Philadelphia 3, Pa., 1952.

A useful reference for counselors who encounter conscientious objectors to military service. Details of procedure under selective service law to obtain assignment to noncombatant service or to civilian work. The facts about criminal prosecution if one is not classified as a c.o., including a realistic description of life in prison.

A Guide to Improving Instruction in Industrial Arts

120 pp., 6 by 9 in., $1 per copy. Discount of 25 per cent for ten or more. American Vocational Association, Inc., 1010 Vermont Ave., Washington 5, D. C.

AVA's best-selling *Improving Instruction in Industrial Arts* is again available, in a completely revised, up-to-date, expanded edition, to serve as the basic teaching tool for industrial-arts instructors.

More than 100 industrial-arts teachers, supervisors, and teacher educators contributed to its contents and to the formulation of its underlying philosophical principles. Outstanding leaders in industrial-arts education were members of the editorial committee, with Chris H. Groneman serving as chairman.

This new edition includes a chapter on objectives in industrial arts, course outline for design in industrial arts, a bibliography for 12 different instructional areas, sources for inexpensive teaching materials.

The areas covered are: drawing and planning, woodworking, electricity and radio, metalworking, graphic arts, plastics, leatherwork, transportation and power, ceramics, textiles, home mechanics, and general shop.

Opportunities in Electrical Engineering
128 pp.

Opportunities in Electrical Trades
96 pp.

Opportunities in the Merchant Marine
160 pp.

Opportunities in Ceramics
96 pp.

Opportunities in Machine Shop Trades
95 pp.

Opportunities in Plastics
128 pp.

Vocational Guidance Manuals, 45 West 45 St., New York 36, N. Y.

The above titles have just been added to the list of the vocational-guidance manuals published by this firm.

These 5⅛ by 7⅞-in. manuals are priced at $1 each. When ordered in quantities of 10, 50, or 100 or more books, 10 per cent, 15 per cent, and 25 per cent discounts are allowed.

These prices and discounts also affect the following revised editions:

Opportunities in Physical Education, Health, and Recreation
Opportunities in the Horticulture
Opportunities in the Hotel Industry
Opportunities in Travel

How to Make Good Pictures

How to Make Good Pictures, the photographic "best seller" of all time is nearing the 4,000,000 mark in English and foreign language editions, the Eastman Kodak Company has announced.

The book, which is generally rated as the best simple text for amateur photographers, is about to go into another 200,000 edition in English and an additional 30,000 edition in Spanish.

Since its publication in 1912, this book has been published in 14 different languages including English, Spanish, Chinese, Norwegian, French,

(Continued on page 30A)

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Tool Room Grinders

Boyar-Schultz Grinders for the tool room and die shop have won a most enviable reputation for accuracy where accuracy counts most. They are dependable . . . the favorite machine tools with skilled mechanics who KNOW how a fine tool must perform.

These tool room grinders have the design, the fine quality materials, and the unexcelled workmanship that make them the best your tool dollar can buy.

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A precision Machine Tool built to provide the close tolerance performance that has long been associated only with larger and more costly grinders. Users tell us that it produces flatness, horizontal and vertical tolerance comparable with any other grinder regardless of size.

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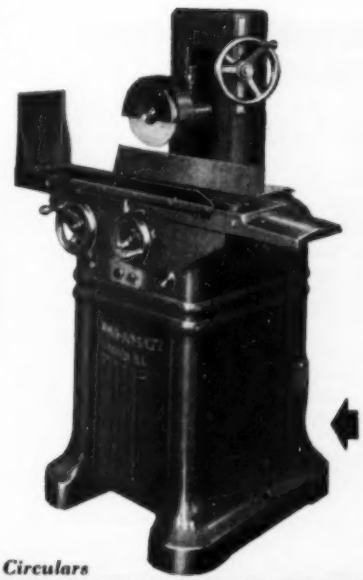

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An extremely accurate Grinder for tool room work and gage grinding, as well as production. Rugged construction and superior engineering assure accuracy over a long period of usefulness.

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NEW PUBLICATIONS

(Continued from page 28A)

Danish, Hindi, Dutch, German, Arabic, Bengali, Tamil, Polish, and Italian.

It has been distributed in practically every country in the world.

The Operation of a Local Program of Trade and Industrial Education

Planned, compiled, and edited by William P. Loomis. Office of Education Vocational Division Bulletin No. 250, Trade and Industrial Series No. 62, 166 pp., 45 cents, 1953. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Prepared in co-operation with joint committees representing the National Association of State Supervisors of Trade and Industrial Education, the National Association of Industrial Teacher Educators, and the National Council of Local Administrators of Vocational Education and Practical Arts, this new bulletin portrays the general structure of a local program of vocational trade and industrial education. It indicates functions and personnel of such a program, as viewed by the authors of the several chapters. Suggestions are made on program objectives, operating methods, staff performance, and responsibility for co-operation with educational groups and with advisory committees.

Shopwork Teaching Tricks

By Michael O'Brien. Cloth, 246 pp., 5½ by 8½ in., illus., $3. The Interstate Printers and Publishers, Inc., 19–27 North Jackson St., Danville, Ill.

A fine book of suggestions for the beginning as well as the experienced shop teacher. While the readers may not adopt all of the author's suggestions, they may receive inspirations that will motivate their own imaginations to devise other tricks that will make their own teaching more interesting and effective.

Not every reader will agree that all of the tricks suggested are good but every teacher will find numerous ideas that will help him in his own work.

The suggestions contained in this book are for the specific areas of shopwork: shop drawing, planning jobs, carpentry, painting, soldering, welding, pipework, concrete, and the like.

The Home and Its Furnishings

By Ruth Morton. Cloth, 463 pp., 6⅛ by 9¼ in., illus., $3.80. McGraw-Hill Book Co., Inc., New York, N. Y.

This book helps the girl high school student realize that she is a part of the family and must assume her share of the duty of planning in making the home more beautiful and livable.

Each chapter contains material for review and numerous projects that may be carried out in the school, the home, or the community.

The book also contains a glossary, a bibliography, and a list of visual aids.

How to Weave Linens

By Edward F. Worst. Cloth, 158 pp., 6⅞ by 10 in., illus., $5.50. The Bruce Publishing Co., 400 No. Broadway, Milwaukee 1, Wis.

This is a reprint of a book that has made thousands of friends among professional and hobby weavers. The author is recognized as a master weaver and master teacher of the craft.

All of the processes of preparing the flax for weaving are carefully and clearly explained. The author then describes the tying up of the harnesses for two, four, five, six, and eight harness drafts.

Numerous drafts for weaving simple and more complex historical patterns are given.

Fatigue of Metals

By R. Cazaud translated by A. J. Fenner. Cloth, 334 pp., 6⅛ by 10 in., illus., $12.50. Philosophical Library, Inc., New York, N. Y.

An excellent theoretical book on an important engineering subject. The book is really a survey of the subject made by a well-known research specialist who is esteemed throughout the industrial world.

It describes the characteristics of fatigue failures, theories of fatigue of metals; fatigue tests and testing machine; fatigue limits of metals and alloys; influence of various factors on fatigue strength with reference to conditions of stress application, shape of parts, temperature, corrosion, and chemical action.

The book also has a chapter on fatigue strengths of structural joints, and one on improving the fatigue strength of machine parts.

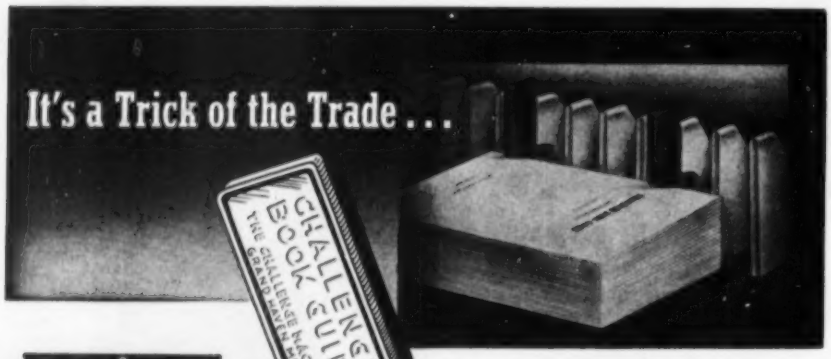
Achieving Your Career

By Joseph S. Kopas and Wiley Garrett. Cloth, 138 pp., 7¼ by 10¼ in., $1.50. Industrial Information Institute, Inc., 36 North Phelps St., Youngstown 3, Ohio.

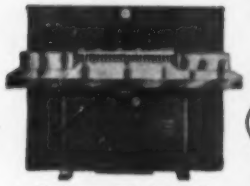
A book produced jointly by industrial engineers, personnel directors, and the vocational directors of the Youngstown, Ohio, schools.

Twelve thousand different kinds of jobs in local business and industry were evaluated and grouped into ten families of vocations on the

(Continued on page 33A)



To get an even cutting edge and assure neater book trimming, use a pair of guides on the backgage. You can buy a book guide to fit any backgage finger up to 1/2" thick.

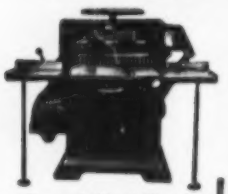


Challenge 370 Automatic (Hydraulic Clamp) Cutter

BUT IT'S NO TRICK TO DO AN ACCURATE JOB WITH A DEPENDABLE

Challenge Cutter

Regardless of your shop size, there is a Challenge cutter for you. There are 11 styles and 7 sizes to choose from, ranging from lever cutters in bench and floor models — to power cutters with hand or hydraulic clamp. Each of these cutters has been perfected by Challenge engineers to give the operator *maximum* protection . . . more working freedom . . . and precise control of cutting operation. A Challenge cutter is a long term investment that pays off in less maintenance . . . greater safety . . . more accurate cutting. 7038



Diamond (Hand Clamp) Power Cutter

Challenge 265-305 Lever Cutter

Challenge 265-305 (Hydraulic Clamp) Power Cutter

Challenge Pony Lever Cutter

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ATF

Good School News

GRAPHIC ARTS—THE EDUCATIONAL FIELD WITH A FUTURE

American Type Founders, Educational Services Department, 200 Elmora Avenue, Elizabeth, New Jersey

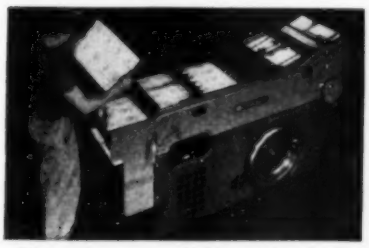
WHITEHALL
...the Stately Type

In this new face just released, ATF has combined the best characteristics of several popular roman faces and omitted their less desirable features. Whitehall is a sound roman letter which embodies certain of the qualities of English oldstyle and transitional letter forms. Very effective, clear and legible as text, while display sizes are compatible with many oldstyle and traditional faces. This is a specimen of 8 and 14 point. Available 8 to 48 point.

New ATF Little Giant Installations in Schools Continue to Meet Steadily Increasing Demand

The industrial arts teacher training program of San Jose State College, San Jose, Calif., one of the best and most up-to-date in the state, now offers the many advantages that a Little Giant makes possible.

In working with this horizontal-type automatic cylinder press, students benefit particularly from its easy operation and close similarity in construction to many larger presses. One important feature is the simplicity with which corrections can be made in the form while on the press. Centralized controls facilitate teaching and operation.



The safest press available today, the ATF Little Giant gives positive protection against mishaps with such mechanisms as the Micro-Safety switch, which prevents operation when the press' side panels are removed. These panels completely guard all parts when the machine is operating.

The number of ATF Little Giant installations in schools is rapidly growing; currently it totals 130.

Junior High School in Brooklyn Provides Well-Rounded Training in Graphic Arts

Program at Arthur Somers Junior High School stimulates academic interest and teaches basic skills

With the great concentration of graphic arts industries in New York City, it is not surprising that the city's schools have 53 well-equipped school printing shops.

The one at Arthur Somers Junior High School, Brooklyn, is typical. Here instructor John M. Fontana conducts five classes daily for 25 to 30 students each.

Shop equipment follows ATF recommendations, including five double-tier school type cabinets, a Challenge proof press, a power-driven platen press, two hand-lever presses, an imposing table, paper cutter, bookbinding and silkscreen units.

The course of instruction is both educational and cultural, stressing historical knowledge of graphic arts subjects as well as practical skills.

During the year, students learn the California job case, print tickets and other small jobs by letterpress, and cut linoleum blocks for book plates. Reading assignments and talks give them the origin, development and present-day aspects of printing. Students make frequent conducted tours of graphic arts plants in the metropolitan area, supplementing school training with first-hand observation of modern production methods and equipment.

After graduation from Arthur Somers Junior High School, many students continue their training in senior high school printing courses and later at the New York School of Printing.

Another view of the well-lighted print shop, where students at Arthur Somers Junior High learn the rudiments of professional printing practices.

Educational Services Department is ATF's "Answer Corner" for School Problems

ATF maintains a specialized service for vocational and industrial arts schools. Suggested layouts for typical shops and printing departments are available to you through our Educational Services Department. We may be able to help you outline training courses, or find competent instructors. ATF also serves as a complete source of supply for equipment. Write for your copy of ATF's booklet, "Career Opportunities in the Printing Industry."

Electricity Texts

FUNDAMENTALS OF APPLIED ELECTRICITY

By E. W. Jones

Especially designed for beginning classes — a text and shop manual covering the fundamentals of electricity and magnetism, both theoretically and practically, in complete, modern, up-to-the-minute form. *$2.76*

PRACTICAL ELECTRICITY

By John E. Crawford

For use in vocational and industrial schools by boys who have not studied electricity before, this text sets forth the principles of electricity, giving the student every opportunity to construct his own equipment and to perform experiments with that equipment. *$2.96*

PREPARATORY ELECTRICITY

By B. Burdette Burling

Boys will obtain a working knowledge of the fundamental principles of electricity and its most common applications to home and industrial uses from these 28 jobs. *$1.56*

LIGHT AND POWER WIRING

By B. Burdette Burling

Revised and modernized, this workbook covers all phases of electric house wiring involving the National Electric Code Rules. Includes the proper connection and installation of all types of switches and wiring methods. *$1.56*

FRESH PROJECT IDEAS

ELECTRICAL PROJECTS FOR THE HOME AND SCHOOL WORKSHOP

By Walter B. Ford

29 projects, selected for their greatest boy appeal and utility, are presented with complete directions, bills of materials, and drawings. *$3.00*

ELECTRICAL THINGS BOYS LIKE TO MAKE

By Sherman R. Cook

Low-voltage electrical devices which delight the boy and teach him the rudiments of practical electricity. 33 projects and a helpful how-to-do-it section. *$2.75*

ELECTRICAL ESSENTIALS FOR THE PRACTICAL SHOP

By F. E. Tustison and P. W. Ruehl

An old favorite (Job Sheets for the Practical Electrical Shop) has been extensively revised and enlarged and brought up to date for use in the modern school shop. It now contains new instructional units, such as devices for wired and wireless communication. Illustrated and flexible, these sheets introduce the student to the most important principles of electrical science. A practical application to common electrical appliances. *$1.36*

ESSENTIALS OF APPLIED ELECTRICITY

By E. W. Jones

A text for beginning courses which is successful in being both scientific and interesting, practical yet properly attentive to theory. Every law, rule, or principle is introduced through some practical electrical device or mechanism which is in common use. *$1.96*

FUNDAMENTALS OF ELECTRICITY

By Charles F. Petersen

The fundamentals of electricity are here presented in the form of separate lessons giving special attention to simplicity and the elimination of technical terms. Ideal for exploratory purposes. *$1.32*

Examination copies sent for 30 days' study

THE BRUCE PUBLISHING CO.
710 Bruce Bldg. Milwaukee 1, Wis.

NEW PUBLICATIONS

(Continued from page 30A)

basis of abilities and aptitudes needed for these jobs.

The material was then arranged and presented so that classroom teachers directed by a supervisor could readily conduct the work.

A teacher-counselor edition, containing much valuable direction, also is obtainable at the same price as the text.

Welding Manual

Imitation leather, 208 pp., 4⅜ by 7⅜ in., illus., $1.75. United States Government Printing Office, Washington 25, D. C.

A handy pocket-size manual which was prepared for engineers and inspectors whose duty it is to design, test, and inspect welded pressure vessels, pipes, and structures.

The manual consists of seven chapters, a bibliography, and an appendix. The various chapters describe welding, welding materials, welding codes and specifications, welding design, inspection and control tests, methods of joining various materials, surfacing and metalizing, and a bibliography.

The appendix describes steelmaking practices, welding metallurgy, and also presents a glossary of terms.

Know Your Merchandise

By Isabel B. Wingate, Karen R. Gillespie, and Betty G. Addison. Cloth, 736 pp., 6¼ by 9¼ in., illus., $4.20. McGraw-Hill Book Co., Inc., New York City.

An excellent book for young people who are preparing for the numerous jobs in retail selling and for the men and women presently engaged in such jobs, and lastly for the consumer who wants to know what he is buying.

The book is divided into two parts. The first of these treats on textiles and describes the fibers used for making cloth, how yarn is made, and cloth woven. It also explains knitting, felting, and lace construction. Then the dyeing and printing of cloth, the household uses of linen, cotton, rayon, acetate, nylon, silk, and wool also are discussed.

Part II is devoted to the nontextiles, such as leather, furs, jewelry, cosmetics, foods, household utensils, chinaware, glassware, silverware, furniture, paper, natural and synthetic rubbers, and plastics.

The book also contains quite a comprehensive bibliography.

Woodworking for Everybody

By John G. Shea and Paul N. Wenger. Cloth, 187 pp., 8½ by 11¼ in., illus., $3. International Textbook Co., Scranton, Pa.

This is a new revised and enlarged edition of this book. Seventeen new projects have been added, all of which will interest students and homecrafters.

Handcrafts for Elementary Schools

By Frank C. Moore, Carl H. Hamburger, and Anna-Laura Kingzett. Cloth, 324 pp., 6¾ by 10 in., illus., $5. D. C. Heath and Co., Boston, Mass.

This handbook contains a great deal of information for teachers of handcraft in the elementary schools. The book has a chapter on how to organize the classroom in which the handcraft work is to be given, and then presents many suggestions and designs for teaching paper crafts, novelty crafts, ceramic crafts, wood crafts, art metal crafts, textile crafts, graphic arts crafts, and leather crafts.

This book will delight both teachers and children.

Industrial Education Films and Filmstrips

By D. P. Barnard and Raymond L. Cornwell. Paper, 84 pp., 8½ by 10⅞ in. Audio-Visual Center of The Stout Institute, Menomonie, Wis.

This is a list of annotated instructional films and filmstrips.

The areas of industrial education covered by this list are: arts and crafts, auto mechanics, bricklaying and cement work, drafting, electricity, graphic arts, metalworking, painting and decorating, patternmaking, photography, woodworking.

The films are rated under the headings: excellent, good, or fair, where a rating could be obtained.

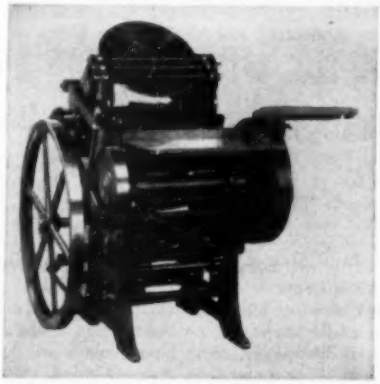
The full title, running time, whether sound or silent, whether black and white or color, source, rental fee, and purchase price are given.

"Who Me?"

"Who Me?" is the name of a 32-page booklet published by The Travelers Insurance Companies,

(Continued on next page)

CHANDLER & PRICE { PRESSES and PAPER CUTTERS



C&P NEW SERIES PRESSES These presses in sizes of 8x12, 10x15, 12x18 and 14½x22, provide the student with equipment that furnishes all practical requirements of hand fed press operation. May be equipped with flywheel, belt and platen guards. Also furnished for treadle operation instead of motor drive.

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C & P presses and paper cutters have been standard equipment in commercial plants and schools for over 50 years. So, the selection of C & P equipment for printing classes places before the students *practical* equipment exactly as used in commercial practice in the entire printing industry.

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C&P PILOT PRESS A thoroughly efficient little press, chase 6½x10, that teaches basic principles of press operation with exceptionally fine printing results.

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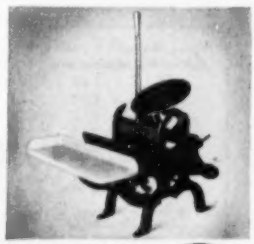

"HANDBOOK OF PLATEN PRESS WORK" *is one of the outstanding aids to printing furnished without charge to printing instructors. If you do not have a copy, just request one.*

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6"	1.75
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NEW PUBLICATIONS

(Continued from previous page)

Hartford, Conn. It tells the story of the two million casualties that were recorded in 1952.

Get a copy by writing to *"The Travelers," Hartford, Conn.*

On Our Way: Future Craftsmen for the Community

Paper, 4 pp. Compiled and published by the Erie Technical High School, Erie, Pa.

Contains an explanation and an outline of the prescribed courses in the Erie Technical High School.

Automotive Collision Work

By Irving Frazee, Earl L. Bedell, and Edward D. Spicer. Cloth, 323 pp., 5¾ by 8½ in., illus., $4.95. American Technical Society, Chicago, Ill.

An excellent text for the school and a helpful reference book for the commercial shop.

Practically every issue of the daily newspaper pictures or describes a wreck which, before it is again usable, requires the services of a good body man.

The various chapters of the book acquaint the reader with the construction of the body and frame; introduce him to the art of metal bumping and dinging; explain about welding, cutting, shrinking, soldering, and metal finishing; discuss the use of power tools; show how to replace, straighten, and align doors, hoods, and deck lids; and straighten frames that have been treated harshly in a collision.

Exploring the Industries

By Chris H. Groneman. Paper cover, 156 pp., 8½ by 11 in., illus., 96 cents retail, 72 cents wholesale. The Steck Company, Austin, Tex.

This work text is intended for the general shop and presents several outlines which may be followed by the instructor in teaching this material to his students.

For instance: all pupils take drawing and planning at the same time for eight weeks. Then the class is divided into three groups which are then rotated three times, thus covering wood, metal, and electricity. Then four weeks are given, allowing the pupil to choose his favorite subject.

Another plan is to have all pupils take drawing and planning at the same time for nine weeks. The class is then divided into three groups which are rotated three times, each group taking wood, metal, and electricity for nine weeks.

Still another plan is to divide the class into four groups and rotate them every nine weeks so that each student at the end has spent nine weeks in each of the subjects — drawing, wood, metal, and electricity.

The book contains concise teaching directions in each of the four subjects mentioned. The illustrations in the book are good and there are quite a number of projects shown from which the student may choose.

South Dakota has recently passed a license law, making drivers' licenses unanimous in all 48 states. The new legislation requires residents to obtain a driver's license in order to operate a motor vehicle within the state. — *Action for Safety*

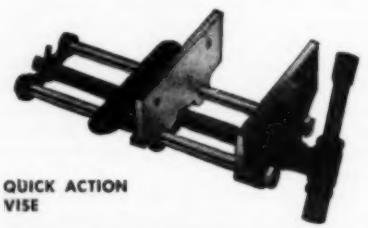
MORGAN VISES

Sound Equipment Investment for Your School Shop

The durable manner in which Morgan vises are constructed is your assurance of lifetime service, even under the most severe conditions. Made of semi-steel castings, each Morgan vise is tested and proven by actual breaking strain for dependable day-by-day use. And all parts are easily replaceable for greater economy!

MORGAN SOLID NUT CONTINUOUS SCREW

A strong, reliable continuous screw woodworking vise, fully machined to withstand the worst in student wear.



QUICK ACTION VISE

This simplest and most effective of the quick acting types always carefully machined and finished. There is nothing to get our of order!

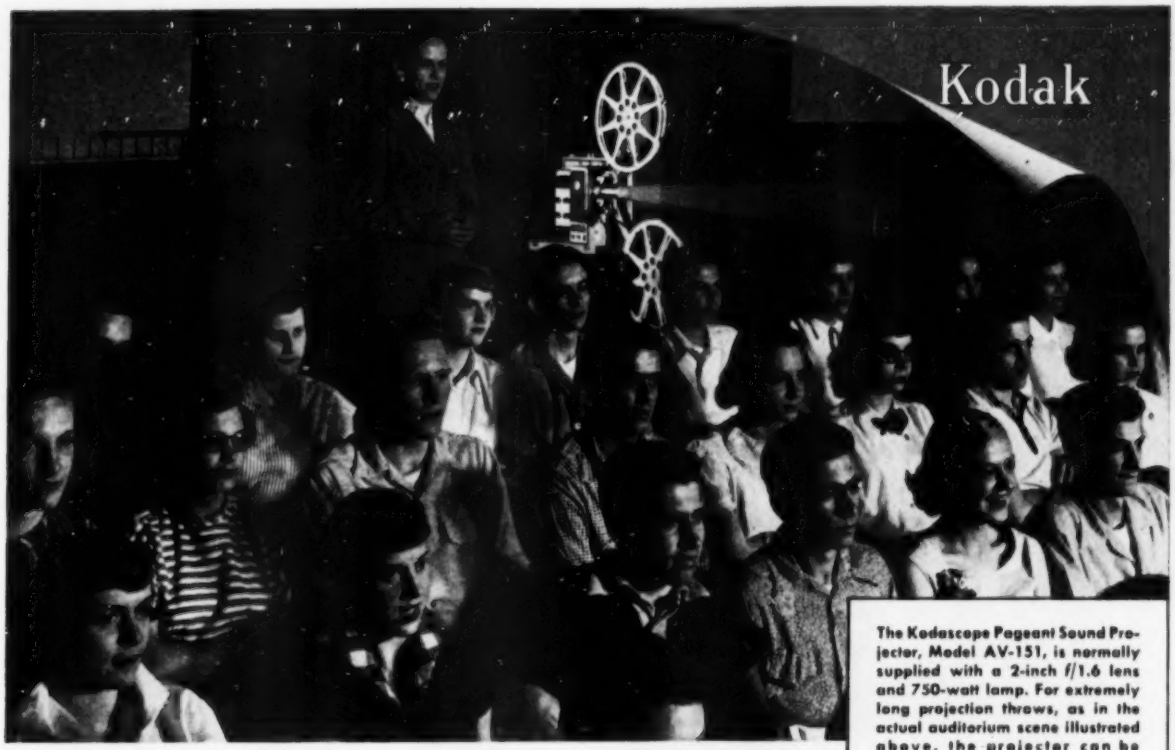
MORE THAN 50 YEARS EXPERIENCE IN MANUFACTURING BETTER VISES! CONFIDENCE THAT MEANS AN UNQUALIFIED GUARANTEE FOR EACH MORGAN VISE!

WRITE FOR LITERATURE AND PRICES!

MORGAN VISE CO.

120 N. Jefferson Street

Chicago 6, Illinois



The Kodascope Pageant Sound Projector, Model AV-151, is normally supplied with a 2-inch f/1.6 lens and 750-watt lamp. For extremely long projection throws, as in the actual auditorium scene illustrated above, the projector can be equipped with a 3- or 4-inch lens and a 1000-watt lamp. Projector, complete with 12-inch speaker and standard lens and lamp, $530.

With the powerful new Pageant Model AV-151, you can "tailor" sound to fit the auditorium!

Auditoriums often present acoustical problems which the average 16mm. sound projector fails to overcome. Often good films are ineffectively presented because sound is "scrambled." Consequently, attention wanders. The message fails to get across. Time is wasted.

In recognition of this trouble, Kodak designed a new portable 16mm. projector for auditorium use—the Kodascope Pageant, Model AV-151—one of a series designed to meet every 16mm. requirement. This model features a 15-watt, high-fidelity amplifier with 12-inch Kodak De Luxe Speaker for extra output and speaker capacity. Separate bass, treble, and Fidelity controls enable you to tailor sound to overcome "boominess," adjust for worn sound tracks or different emulsion positions so that you get the best results obtainable from every film.

Like *all* portable Kodak 16mm. Projectors, this model is permanently pre-lubricated—an exclusive feature with Kodak 16mm. sound equipment which eliminates the chief cause of breakdowns.*

Ask your Kodak Audio-Visual Dealer to demonstrate the full Kodak line. For extra screen brilliance, there are two Pageant models equipped with the remarkable Plus-40 Shutter—giving more than 40% extra light. For sports analysis, the new Analyst Projector is designed for heavy-duty reversing. And for "average" sound projection, the moderately priced Pageant, Model 1, is tops. Call your dealer today—or write Kodak for further information.

*Here's what A-V experts say about Pageant pre-lubrication

"Proper lubrication is essential to any moving mechanical part. The Pageant Projector's pre-lubrication is insurance against excessive wear and equipment failures, caused by lack of lubrication."

Wayne K. Newman, *Mgr.*
Desert Book Company
Salt Lake City, Utah

"Breakdowns help our repair business, but we'd rather keep our customers happy and satisfied with their purchases. That's why we go all out on the Pageant with its permanent lubrication."

Elmer J. Peters
J. E. Foss Company
Pittsburgh, Pa.

"Permanent lubrication is the most important development we've seen in years to assure projector dependability. Lubrication worries are over for schools and churches that use the Pageant."

Ben A. Rentz, Jr.
Baptist Book Store
Fort Worth, Texas

"You'd be surprised how many school projectors come in for repairs due to lack of lubrication. Pageant pre-lubrication saves schools on repair bills and avoids loss of use during a busy season."

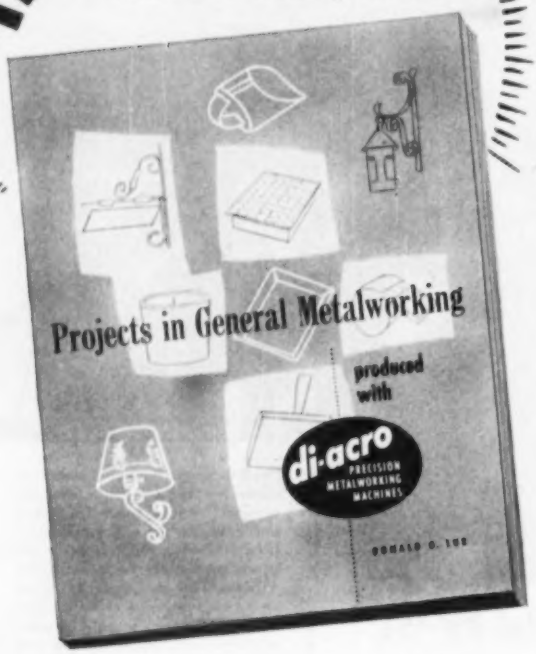
J. Fred Kyle
Kyle & Company
Clarksburg, W. Va.

MOTION PICTURES . . . teach, train, entertain

Price subject to change without notice

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

IDEA BOOK
for the Metalworking Instructor



32 PAGES of "How-To-Do-It" data

A copy of "*Projects in General Metalworking*" by Donald G. Lux, University instructor, is yours for the asking. Common metalworking projects, easily made with Di-Acro Machines, are clearly illustrated. Techniques are described such as bending scroll shapes, setting down a hem, and box and circle forming. Step by step procedure for making metal items like a pin-up lamp, kitchen scoop, nameplate bracket, waste basket and dustpan are easy to follow.

Simply make a request on your school letterhead and a copy of this valuable booklet will be mailed you promptly, and without charge. Classroom quantities are also available at 25c each.

Di-Acro Rollers, Brakes, Benders and other bench machines are ideal for the school shop. Complete specifications and costs are included with the booklet. *Write today for your free copy!*

DI-ACRO BENDER NO. 1

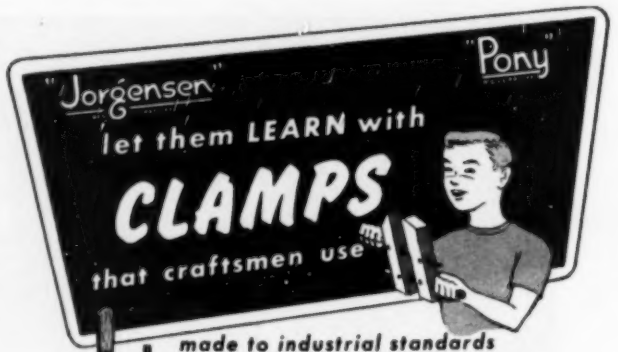
DI-ACRO is pronounced Die-ack-ro—the brand name for more than 40 hand and power operated precision cutting, punching and forming machines.

DI-ACRO FINGER BRAKE

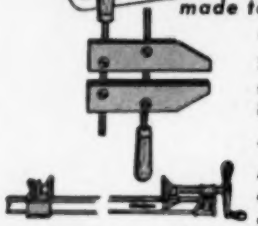
DI-ACRO ROLLER

di-acro PRECISION METALWORKING MACHINES

O'NEIL-IRWIN MFG. CO.
351 Eighth Avenue, Lake City, Minn.



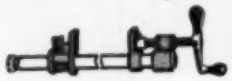
made to industrial standards



"Jorgensen" HANDSCREWS
Steel spindles—properly seasoned hard maple jaws. A wood working tool that is a "must" for proper training.

"Jorgensen" I-BAR CLAMPS
Adjusts instantly to the work for faster operation. A real improvement over older types.

"C" CLAMPS — "Jorgensen" and "Pony" C Clamps are made in a variety of styles and sizes. Economical and dependable.



"Pony" CLAMP FIXTURES
Mount on ordinary black pipe to make ideal, instant acting, bar clamps. A great school-shop favorite.

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ADJUSTABLE CLAMP CO.
424 No. Ashland Ave. • Chicago 22, Ill.

Harper

TRUE PORCELAIN KILNS

Versatile Firing Range 0–2500° F.

You'll want one of these Harper Electric kilns for your school Ceramic Department. Their wide firing range of 0–2500° F. allows students and instructors to experiment with all types of low temperature and high temperature Ceramic ware, including *true hard* porcelain.

Advantages for your school are many; Harper Studio Kilns:

- are clean, quiet and safe to operate in any classroom
- are sturdily constructed to withstand maximum use
- require little maintenance
- have a versatile firing range of 0–2500°F.
- are economical to operate and maintain.

SK-151416 Harper Studio Kiln with 1½" cu. ft. capacity.

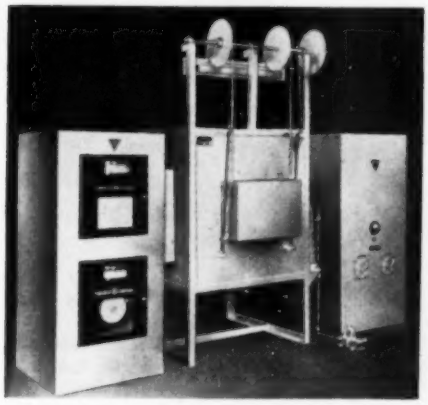
Let us send you Bulletin 1246 describing Harper Studio kilns being used in many leading school and universities throughout America.

HARPER ELECTRIC FURNACE CORP.
Dept. 3
39 River Street Buffalo 2, N. Y.

SHOP EQUIPMENT NEWS

(Continued from page 56A)

assured against all sides of the opening. The flame curtain is located immediately below the opening and ignites automatically when the door opens.



New General Purpose Heat Treating Furnace

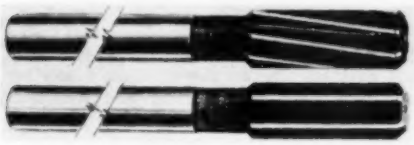
Globar elements with air-cooled terminals are located beneath the hearth and above the chamber to effect maximum uniform heat transfer. The elements, which extend completely through the furnace, may be replaced without unloading or otherwise disturbing the furnace.

Further information is obtainable from the *Pereny Equipment Co., Columbus, Ohio.*

(For Convenience Circle Index Code 0808)

STRAIGHT AND SPIRAL FLUTE, STRAIGHT SHANK REAMERS

Whitman & Barnes has recently added new sizes to its regular line of Straight Shank Straight Flute and Straight Shank Spiral Flute Chucking Reamers. In the Straight Flute type, the following sizes will now be considered standard items:



Straight Shank Spiral Flute Chucking Reamer and Straight Shank Straight Flute Chucking Reamer

Fractional sizes — all 64th sizes from $\frac{3}{64}$ in. through $\frac{31}{64}$ in.

Wire-gauge sizes — No. 1 to No. 60 inclusive

Letter sizes — A to Z inclusive

Decimal sizes — .124, .126, .1865, .1885, .249, .251, .3115, .3135, .374, .376, .4365, .4385, .499, .501 in.

Spiral Flute type — all 64th sizes from $\frac{5}{64}$ in. through $\frac{31}{64}$ in.

For further information about these reamers write to *Whitman & Barnes, Plymouth, Mich.*

(For Convenience Circle Index Code 0809)

(Continued on next page)

Ready to use
when classes start
with no waste
Because Franklin Glue is ready to use right out of the can or tube there is no waste from over-mixing or spoilage. Pour unused glue back into can when through. Foolproof for beginners. Will not stain wood . . . it's "the choice of fine craftsmen everywhere."
FRANKLIN
Genuine Hide GLUE
and the extra strength of GENUINE HIDE GLUE
GENEROUS SIZE
SAMPLE TUBE FREE
when request is made on official school letterhead.
AVAILABLE IN 7 SIZES
GALLON
QUART
PINT
½ PINT
¼ PINT
2 OZ.
TUBE
EVERTITE
RESIN GLUE
READY TO USE
We also make the best WHITE GLUE
EVERTITE is a liquid resin glue, ready to use. Available in tubes, 2 oz., ¼ pt., ½ pt., pt., qt. and gallon sizes.
SAMPLE ON REQUEST
you can use tubes on shop cards —
You can now supply each student with a tube of Franklin Glue for a project. Include the cost of glue in your rotating fund supported by shop cards instead of paying it as part of regular budget.
The Franklin Glue Co.
131 W. Chestnut St.,
Columbus 15, Ohio

SHOP EQUIPMENT NEWS

(Continued from previous page)

THE MOTO-SAW CONVERTED INTO A TABLE SAW

The Dremel Manufacturing Company have prepared a work sheet showing how a Moto-Saw can be converted into a table-type saw.

The parts to be made are shown full size, so that even a beginner will have little or no trouble in providing himself with an exceedingly handy electric table saw with which he can do a great deal of presentable scroll saw work.

For further information, write to the *Dremel Mfg. Co., Racine, Wis.*

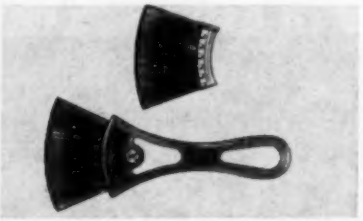
(For Convenience Circle Index Code 0810)

Moto-Saw transformed into a Table Saw

HOWELL DEVICE COMPANY PARTS CLEANING BRUSH

The New Parts Cleaning Brush, made by the Howell Device Company, is excellent for use wet or dry for general purposes around machine tools.

It is rust, spark, and warp proof, its bristles are made of a specially treated fiber which will not mush, flare, ball up, or get flabby when used with liquid for parts cleaning.



Parts Cleaning Brush with Refill Holder

The bristles, in the brush head are held mechanically (no cement) in a refill holder held in place by one screw providing quick change for new brush head, which costs about one third of complete brush price.

For further information write to the *Howell Device Co., 8817 Maywood Ave., Cleveland 2, Ohio.*

(For Convenience Circle Index Code 0811)

NEW TEACHING PROJECT FOR AIRCRAFT — SHEET-METAL WORK

The Schweizer Aircraft Corporation is developing a series of *training kits* designed to teach aviation construction techniques and aluminum sheet-metal work. Students gain not only effective training but the end product of the project is useful.

The first of the series is the Schweizer Utility Case Project No. 1. The basic kit includes all the materials for making a Utility Case with ends preformed to shape, necessary hardware, blueprint and student procedure instructions.

This project has been developed to provide a practical project using modern aircraft materials of aluminum and plastic. Most of the work on the project can be done with ordinary shop tools. The only extra tool that may be required is a hand rivet set. The kit project offers a way to teach basic sheet metalworking and blueprint reading in conformance with aircraft standard procedures.

For further information address *Schweizer Aircraft Corp., Elmira, N. Y.*

(For Convenience Circle Index Code 0812)

GREASE CHAMP WIPING CLOTH

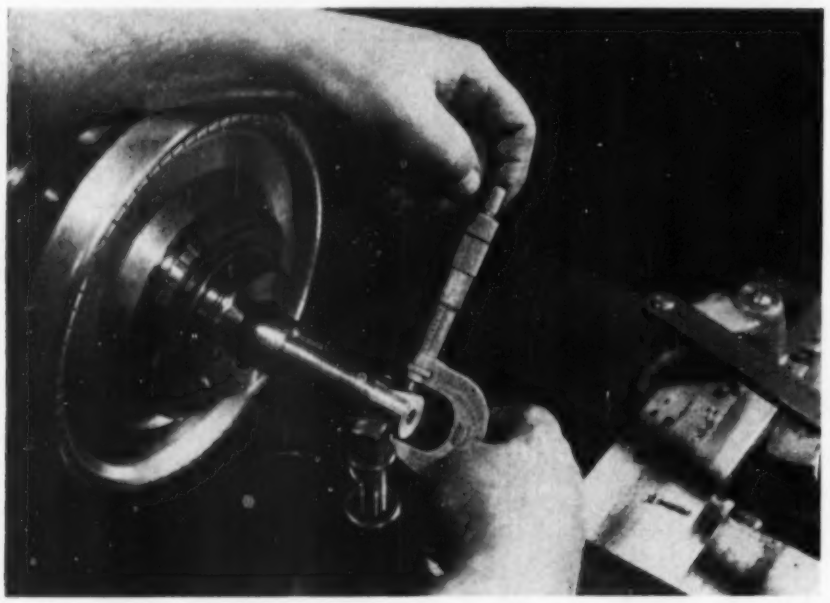
The Safeguard Company are offering an extremely effective absorbent wiping cloth which they have named the Grease Champ Wiping Cloth. It is a strong cotton fabric somewhat heavier than cheese cloth, which absorbs several times its weight in grease and grime. It is fine also for applying and removing the first coat of wax on wood or metal.

For further information write to *Safeguard Co., Inc., Dept. B, Box 744, Holyoke, Mass.*

(For Convenience Circle Index Code 0813)

(Continued on page 40A)

ON THE JOB YOUR STUDENTS WILL USE LUFKIN TOOLS



Today, in your classroom, train them with Lufkin precision tools—the tools they will use on the job tomorrow. Years of fine tool-making experience combined with the latest design features have made Lufkin precision tools recognized as the Standard of Accuracy in American industry.

An interesting and instructive booklet, "Micrometer Reading Made Easy," will be supplied to you in quantities sufficient for class needs. It is illustrated in clever cartoon style. Write (stating number desired): The Lufkin Rule Company, Saginaw, Michigan, Dept. V.

BUY LUFKIN TAPES • RULES • PRECISION TOOLS
From Your Industrial Distributor

THE LUFKIN RULE CO., SAGINAW, MICHIGAN
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214

"One picture is worth a 1000 words"

four FREE movies...

TO HELP YOU TEACH EASIER AND FASTER!

All easy to understand, specially produced to interest and inform students in technical courses.

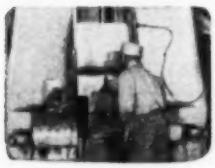
❶ 5000 YEARS OF FORGING

Produced to answer many questions on the subject of forging, this movie traces its history thru many centuries, from the caveman's bronze forgings, handcrafting of middle-age armour and early American tools. Includes actual demonstrations of old-time forging methods. **19 min., 16 mm, b&w, sound**

❷ MANUFACTURING JET BLADES

A vivid, interesting story on the manufacture of aircraft jet blades—from the sinking of forging dies thru many steps of precision forging, machining, and final inspection. **15 min., 16mm, b&w, sound**

❸ ADD POWER TO YOUR HANDS



Tells viewer what industry does to provide him with quality tools. Shows manufacture of drop-forged pliers, their built-in capabilities due to steel quality, fibre structure, proper hardening. A story of progressive modern manufacture. **10 min., 16 mm, b&w, sound**

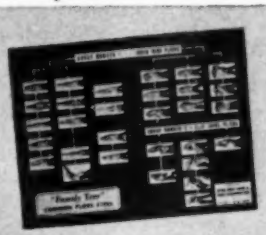
❹ PLIERS: THEIR USE AND CARE

Explains and demonstrates the proper care of pliers, simple repairs, how to check jaws and resharpen cutting edges. Proper way to use pliers for best results; different types of pliers designed to do special jobs. **10 min., 16 mm, b&w, sound**

ABOVE FILMS MAY BE RUN IN COMBINATION

THREE FREE WALL CHARTS

...excellent reference material for your students!



❺ FAMILY TREE OF COMMON PLIERS TYPES

Gives a clear, basic knowledge of major types of pliers and their variations. Invaluable for instruction. **Size 21" x 10" in two colors**

❻ HOW TO USE PLIERS

Basic information on proper way of holding pliers; how to pick size and shape for your specific purpose, and other interesting features. **Size 32" x 12" in two colors**

❼ WHY DROP-FORGED TOOLS LAST LONGER

Illustrates how drop-forging and induction-hardening make pliers, adjustable wrenches and other tools more serviceable. Good background for all tool users. **Size 32" x 12" in two colors**

GOOD TOOLS MAKE BETTER TEACHERS!

Cheap tools handicap the pupils, waste time and energy, may make it much more difficult for you to demonstrate a problem. Good tools make work easier and surer... and pupils learn faster and better. So specify UTICA TOOLS® for better teaching and long-range economy.

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DROP FORGE AND TOOL CORPORATION

Utica 4 New York

MAIL THIS COUPON NOW!

I.A.V.E.

TO: Utica Drop Forge & Tool Corp., Utica 4, N. Y.

Please send material checked:

MOVIES: For showing on _____ Date

1. 5000 Years of Forging ☐ 3. Add Power to Your Hands ☐
2. Manufacturing Jet Blades ☐ 4. Pliers: Their Use and Care ☐

Films are loaned FREE, user pays return shipping charges only.

WALL CHARTS: Mailed free for your use.

5. Family Tree of Common Pliers Types ☐ 6. How to Use Pliers ☐
7. Why Drop-Forged Tools Last Longer ☐

Name _____

Street Address _____

City _____ *Zone* _____ *State* _____

SHOP EQUIPMENT NEWS

(Continued from page 38A)

1/2-IN. DRIVE IMPACT WRENCH

Snap-on Tools Corporation announces the availability of a new ½-in. square drive electric impact wrench. This tool, the EW-500, can be used with a variety of sockets and attachments to greatly increase the working speed of any mechanic. Special attachments are available to handle either slotted or Phillips screws and are especially useful for door hingework.

After a certain torque is reached the rotary action of the heavy duty motor is transferred through the impact mechanism to sharp, powerful blows at the drive spindle. The blows become heavier as the torque increases, thus, the larger the nut — the heavier turning impact it receives. It delivers up to 2000 of these powerful rotary blows per minute, and as there is no direct connection, the motor runs continuously; it cannot be stalled or burned out because of overload. None of the torque is transmitted to the operator, which allows easy one-hand operation under all working conditions.

Forward or reverse action with or without the motor running is obtained by twisting the end cap, and the positions are clearly indicated on the smooth, die-cast aluminum housing.

Planetary reduction gearing is used for reducing motor speed and all the teeth are induction hardened. This impact wrench is so simply constructed that the whole tool can be disassembled without special tools or equipment.

Over-all length of the tool is 10⅛ in., with a maximum diameter of 3 9/16 in. Top of the wrench to the center of the spindle is only 1½ in. Two models are available, one for 115 volts, and the other for 220-volt operation, and both are equipped with 25 ft. of heavy duty, neoprene covered cord.

For further information, write to *Snap-on Tools Corp., Kenosha, Wis.*

(For Convenience Circle Index Code 0814)

TEXTBOOK ON MIMEOGRAPHING

Fundamentals of Mimeographing is the name of the textbook which has been extensively revised to take into account recent developments in the mimeographing field.

This revision points out the progress that has led to the revolution in the field summed up by the phrase "Modern Mimeographing" and includes pictorial and descriptive pages aimed at giving a better understanding of stencil duplicating. The book contains detailed information concerning variations in stencil sheet assembly and instructions for typing stencils with "coated" and "tissue" cushions respectively.

For further information write to *A. B. Dick Co., 5700 West Touhy Ave., Chicago, Ill.*

(For Convenience Circle Index Code 0815)

PLUMB REHANDLING KITS

A complete line of rehandling kits, with handles for every size of hammer and hatchet, is being put on the market by Fayette R. Plumb, Inc. With one of these kits anyone can replace an ordinary hammer handle with one made of second-growth hickory tested to withstand 23,000 pounds maximum fiber stress at the weakest point.

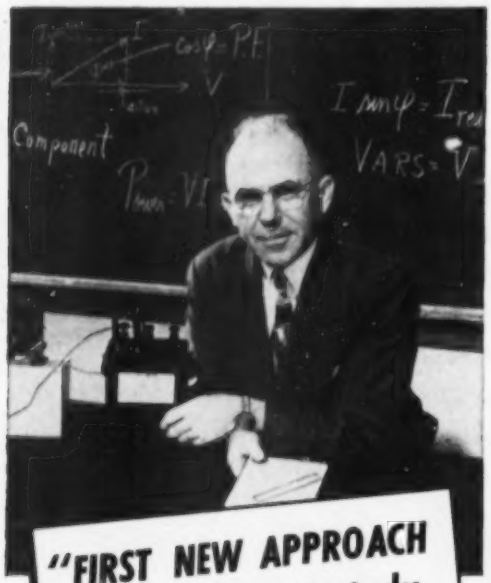
Since the steel head of a Plumb tool often outlasts the handle, the company brought out a single kit in 1950. This kit contained a handle for the 16-ounce head, most popular sized hammer.

It has been discovered that these hickory handles were being purchased to replace handles made from inferior types of wood.

Frequent requests for various additional sizes of handles have prompted the furnishing of Plumb Rehandling Kits, each of which contains a completely finished hickory handle which is stained and varnished; two wedges, one cement-treated hardwood and the other a metal cross wedge; and an illustrated set of instructions showing how a tool can be rehandled in five minutes.

For prices write to *Fayette R. Plumb, Inc., 4837 James St., Philadelphia 37, Pa.*

(For Convenience Circle Index Code 0816)



"FIRST NEW APPROACH to a-c current study in 50 years"

—says Professor Harold W. Bibber, head of Union College's Electrical Engineering Department

AF-2 Load Visualizer

Check these features

- Measures volts and vector amperes
- Watts, power factor, and vars can be quickly determined
- Self-contained to 50 amperes
- Extensible to 1000 amp by current transformers

G.E.'s AF-2 Load Visualizer provides an easier way to introduce students to current-vector analysis. You needn't interrupt your explanation of principles to make lengthy computations. The instrument and calculator get the answers quickly and simply.

For complete information, contact your nearest G-E Apparatus Sales Office, or write for bulletin GEC-372 to General Electric Co., Sect. 687-74, Schenectady 5, N. Y.

You can put your confidence in—

GENERAL ELECTRIC

Descriptive Material

NEW BRODHEAD-GARRETT CO. CATALOG

Brodhead-Garrett Company have issued their comprehensive catalog for 1953–54.

It covers the need of the school shops in the elementary, junior high and senior high, technical high, and vocational schools, and lists these needs in the areas of lumber, hand and power tools, materials and instruments used for craftswork, fine arts and mechanical and architectural drafting.

(Continued on page 42A)

There is no name better known than K&E to draftsmen, engineers, architects for the tools and materials they work with.

Whether for drafting equipment, such as drawing instruments, scales, T-Squares, triangles; for drawing and tracing papers and cloths; for reproduction materials; for slide rules – to name just a few things – K&E is known as "tops".

There is a K&E School Line for students too, made in the K&E tradition of quality, and rightly priced for the student's pocket.

Have you had your copy of the 1953-1954 K&E School Catalog? If not, drop a card in the mail to Keuffel & Esser Co., Hoboken, N. J.

We are exhibiting at the AVA Convention in Chicago in November.

KEUFFEL & ESSER CO.

EST. 1867

Drafting, Surveying, Reproduction Equipment and Materials • Slide Rules • Measuring Tapes

NEW YORK • HOBOKEN, N. J.

CHICAGO • ST. LOUIS • DETROIT • SAN FRANCISCO • LOS ANGELES • MONTREAL

THREE NEW CRAFTOOL FIRSTS!

Here they are! Three brand new, popular-priced members of the Craftool family – a Treadle Wheel, an Electric variable speed Potters Wheel, and a Universal Ball Mill – all with outstanding advance-design features that can't be found in machines at double the price.

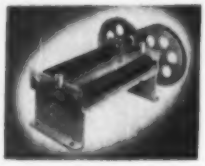
Precision engineered, these ruggedly constructed potters wheels are completely self-contained, fully equipped, highly sensitive floor model units.

The new Craftool Ball Mill features superior quality and greater capacity at an unusually low price!

These unusual new machines are the ideal answer to the needs of schools, hobbyists and professional ceramists.

TREADLE WHEEL
Cat. No. 4110
Price **$120** complete – nothing extra to buy.

ELECTRIC Variable Speed WHEEL
Cat. No. 2110
Price only **$98.50** complete with belts, pulleys and standard equipment, less motor.
1/4 HP. MOTOR–$15.95



BALL MILL
Handles jars up to 1 gal.
Cat. No. 7810
Price only **$35** complete with belts and pulleys, less motor
Cat. No. 7820 with 20" rollers to handle 2 one gal. or 3 one qt. jars – **$42.50** complete with belts and pulleys, less motor

..And of course, the famous, Versatile CRAFTOOL – **$179.50** complete with ball-bearing motor, stand, controls and standard equipment
..a complete ceramic shop – ready to plug in.

Craftool attachments are available at extra cost. All prices F. O. B. Kalamazoo, Michigan.

SEND for FREE CATALOG
of these new machines and other ceramic equipment and tools manufactured by
CRAFTOOLS, INC.
401 Broadway, Dep't. IA New York, N.Y.

DESCRIPTIVE MATERIAL

(Continued from page 40A)

Electric measuring instruments, motors, blowtorches, gas and electric welders, hand and electric forges, heat-treating furnaces, foundry supplies, plastics, shop books of all kinds, leather tools and accessories, block printing, air brush equipment, weaving looms, ceramic kilns, and pottery supplies, art paper, crayons, etc., also are listed.

For a copy of this useful catalog, write to *Brodhead-Garrett Co., 4560 East 71st St., Cleveland 5, Ohio.*

(For Convenience Circle Index Code C817)

NO. 53 CRATEX CATALOG

Presenting the adaptability, versatility, and application of Cratex Rubberized Abrasives, together with complete specifications and prices is the interesting content of the new Cratex Catalog No. 53, just issued. The new catalog contains a most complete and comprehensive treatise about rubberized abrasives on burring, smoothing and polishing operations and their use in industrial establishments.

Cratex Rubberized Abrasives are backed by 30 years of industrial professional, and technical application-performance and are manufactured in wheels, points, blocks, sticks, and cones for machine or manual application. All Cratex products are made in four standard "grit types" ranging from relatively coarse to extremely fine textures, and give excellent results on hard or soft metals, plastics, ceramics, and other materials.

The new Catalog No. 53 is available free from *Cratex Manufacturing Co., 81 Natoma Street, San Francisco 5, Calif.*

(For Convenience Circle Index Code C818)

HELLER BROTHERS COMPANY CATALOGS

Heller Brothers Company have prepared a series of catalogs on their complete line of files and tools.

The new Heller Swiss Pattern file catalog is now in production. Six other catalogs describing Nucut American Pattern files, Vixen Milled Curved Tooth files, American-Swiss Swiss Pattern files, American-Swiss American Pattern files, and Heller tools already are in print, as is also a handy 64-page full-line file catalog.

All of these are two-color books, completely illustrated, with separate price lists.

The company announces that the Rotary File and Carbide Bur catalog is being developed and will be in production soon.

These catalogs are available by writing to *The Heller Brothers Co., Newcomerstown, Ohio.*

(For Convenience Circle Index Code C819)

SOUTH BEND LIGHT TEN LATHE CATALOG

A new 12-page catalog No. 5216 featuring South Bend Lathe's Light Ten Lathe is now ready for distribution. Both bench and floor type lathes in the Quick Change Gear and Toolroom models are shown.

Complete specifications are given for the various models covering capacity, feeds and speeds as well as dimensions and shipping weights. A wide selection of attachments and accessories for the Light Ten lathe are also pictured.

(Continued on page 45A)

PROUDLY WE HAIL...

The new revised edition of

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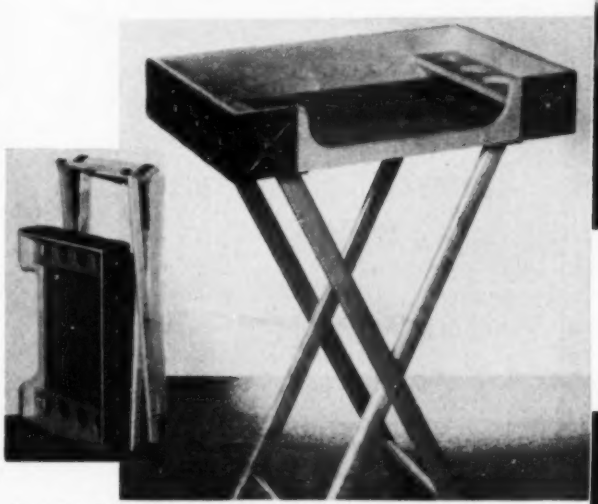
Hit the nail on the head . . . that's all it takes to attach Dek-tufts to any wooden surface, round or flat . . . And the finished piece of work will rival any professional product.

Countless economical uses are limited only by the extent of the imagination. Eight vibrant colors combine and contrast with all color schemes: forest green, lime, gray, red, ivory, beige, tuscan wine and black.



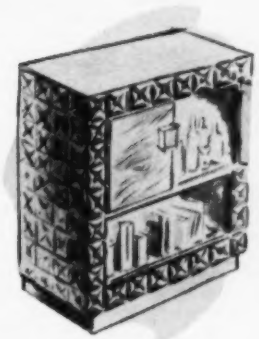
Portable folding bar . . . serving tray may be detached.

As a special offer Dek-tufts may be purchased by schools at 6¢ per square. A box of 50 threaded matching nails is only 25¢.

FREE samples and literature are available to you, as well as instructions for constructing items featured here and many others. Write today.

JAYDON, Inc. 482 BROOME ST., NEW YORK 13, N. Y.

Nails may contrast with Dek-tufts as shown in cornice. Complete ensembles may include lamp and table, picture frames, cigarette boxes, book case, etc.



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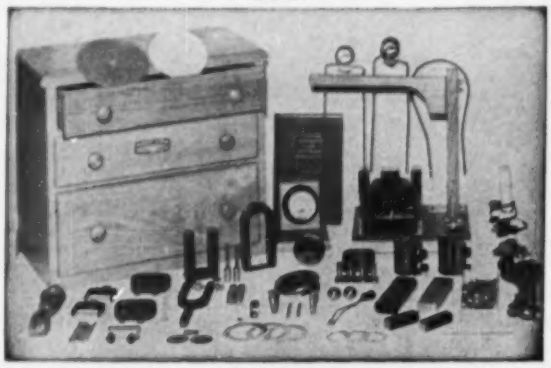

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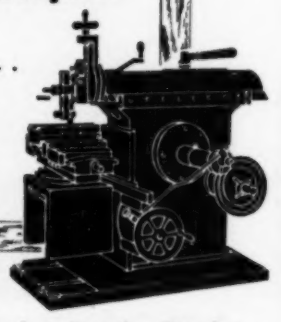

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Lewis MACHINE TOOL COMPANY
7009 South Pacific Drive Whittier, California

DESCRIPTIVE MATERIAL

(Continued from page 42A)

Copies of the catalog may be had by writing to *South Bend Lathe Works, 425 East Madison Street, South Bend 22, Ind.*

(For Convenience Circle Index Code 0820)

NEW "JORGENSEN" AND "PONY" CLAMP CATALOGUE

The Adjustable Clamp Company announces publication of their new catalogue No. 18, now available for general distribution. This attractive, 28-page edition describes the complete *Jorgensen* and *Pony* line of clamps and handscrews, including all the established favorites as well as several designs announced in conjunction with the new catalogue. Among the new styles are *Pony* spring clamps, and *Jorgensen* band clamps and machinists' clamps.

The catalogue is well illustrated and descriptive, and includes, in addition to ordinary *catalogue details*, many how-to-do-it suggestions.

Copies of the new catalogue are now available. Write to *Adjustable Clamp Co., 417 No. Ashland Ave., Chicago 22, Ill.*

(For convenience Circle Index Code 0821)

NEW PORTABLE ELECTRIC TOOL CATALOG

The Porter-Cable Machine Company recently issued a 38-page catalog which lists 52 portable electric tools and kits with over 400 attachments for use in contracting, woodworking, industry and maintenance, school shops, and homecrafters' and farmers' shops. The book clearly illustrates the tools and their uses. Included are complete specifications and prices for electric saws, sanders, grinders, drills, planes, routers, shapers, hedge shears, combotools, radial arms, blades, abrasive wheels, disks, and tool accessories.

Send 10 cents with your request for Catalog No. 101 from *Porter-Cable Machine Co., 24 Exchange St., Syracuse 8, N. Y.*

(For Convenience Circle Index Code 0822)

CATALOG ON TAPS

The DoAll Company has released a new 16-page catalog listing their line of quality taps. Types covered in this literature include hand machine screw, nut, pulley, pipe, tapper, and hook taps. Each type is illustrated to facilitate identification and charts following each illustration provide complete ordering information. For example, one section gives instructions for ordering special taps; another section gives general educational instructions for ordering all kinds of taps. Included are handy charts giving drill sizes for various thread dimensions.

For a free copy of this catalog, call the nearest DoAll Sales-Service Store or write *The DoAll Company, Des Plaines, Ill.*, and request Bulletin No. 51-813.

(For Convenience Circle Index Code 0823)

NEW HAND-TOOL CATALOGUE

A new hand-tool catalogue has just been completed by the Greenlee Tool Company, illustrating its line of auger bits, drills, chisels, gouges, spiral screw drivers, push drills, and other tools for professional or amateur use.

Copies of this new catalogue are available through hardware wholesalers handling Greenlee products, or by writing direct to *Greenlee Tool Co., 2136 — 12th St., Rockford, Ill.*

(For Convenience Circle Index Code 0824)

CATALOGUE OF TRAINING MATERIALS AVAILABLE

The American Society of Training Directors has revised its "Catalogue of Training Materials" available through its library at Purdue University.

The new catalogue contains lists of materials available on apprentice training, clerical, office job training, company and product familiarization training, management and professional training, program development and administration, conference leadership, sales and service training, supervisory training, and many other phases of on the job training.

The catalogue is now available and copies may be obtained by sending $1 to the *Journal of Industrial Training, 168 East 48th St., New York 17, N. Y.*, or the *Secretary-Treasurer's Office, 2020 University Ave., Madison 5, Wis.*

(For Convenience Circle Index Code 0825)

RADIO, TELEVISION, AND ELECTRONICS CATALOG

The Burstein-Applebee Company has prepared a 156-page buying guide for those interested in radio, television, and electronics. It also has a section on tools, power tools, technical books, high-fidelity equipment, and the like.

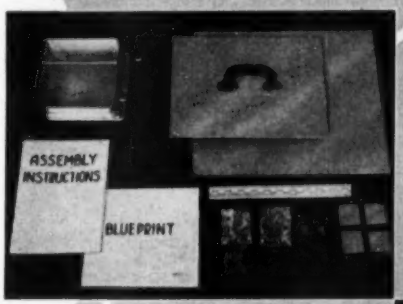
For your copy write to *Burstein-Applebee Co., 1012–1014 McGee St., Kansas City 6, Mo.*

(For Convenience Circle Index Code 0806)

(Continued on next page)

Now! A PRACTICAL SCHOOL PROJECT for AVIATION SHEET METAL WORK and AVIATION CONSTRUCTION TECHNIQUES

Here is a dual-purpose project for students offered by SCHWEIZER AIRCRAFT CORP. builders of world famous sailplanes and military aircraft components. The Schweizer School Project Kit provides: A complete, effective teaching medium which requires No preliminary instructor preparation, and results in a practical multi-useful utility case your students will want.



The Schweizer Kit: includes blueprint, assembly instructions, and all materials including preformed ends and hardware. Complete project test-proved in schools. Only common hand tools required. Optional related background material available for Instructors includes Instruction Manual and material for demonstration and practice.

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DESCRIPTIVE MATERIAL

(Continued from previous page)

THE BOICE-CRANE CATALOG NO. 53

A new 52-page catalog of power tools, for cutting, shaping, drilling, and finishing wood, metal, fiber, and plastics, has just been released by Boice-Crane Company.

The catalog, printed in two colors, is profusely illustrated and carries complete descriptions of band saws, contour saws, band filers, drill presses, tool and knife grinders, jig saws, jointers, lathes, planers, belt sanders, drum sanders, spindle sanders, saw jointers, saw tables, shapers, and shaper cutters.

A copy of this catalog, No. 53, will be sent free to anyone addressing his request to *Boice-Crane Company, 932 Central Avenue, Toledo 6, Ohio.*

(For Convenience Circle Index Code 0827)

NEW RIVETT THREAD TOOL CATALOG

A new bulletin No. 110D describing its popular threading tool has just been published by Rivett Lathe & Grinder, Inc., Boston, Mass.

Fully illustrated is how this quick and easy-to-use threading tool produces a perfect thread independent of operator skill and the successive operations of an indexing system which presents each of ten cutter teeth to the work to form the thread.

For a copy of catalog 110D, write to *Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass.*

(For Convenience Circle Index Code 0828)

EQUIPMENT LITERATURE

A BOOKLET ON FOUNDRY FLASKS

The Sterling Wheelbarrow Company has just published a new booklet entitled "How to Select and Maintain Foundry Flasks."

It describes clearly and concisely about size determination, cope depth and amount of sand, depth of drag and cheek, design of flasks, pin arrangements, and size and weight determinations for clamping.

For further information write to *Sterling Wheelbarrow Co., 7036 W. Walker St., Milwaukee 14, Wis.*

(For Convenience Circle Index Code 0829)

RIVETT LATHE & GRINDER BULLETIN

The complete line of Rivett cabinet lathes, hand turret lathes, toolroom lathes, internal and universal grinders, are illustrated and described in a new general bulletin just published by Rivett Lathe & Grinder, Inc., Boston, Mass.

The new Bulletin No. 500F offers important data. Each Rivett machine is described in detail with specifications. Illustrations indicate work-saving methods combined with precision. The firm guarantees its toolroom lathes to turn or bore within .0001 in. in 6 in.

For a copy of Bulletin 500F, write to *Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass.*

(For Convenience Circle Index Code 0830)

HOBART ARC WELDING NEWS

Volume IX, No. 4, Hobart Arc Welding News, a 20-page booklet of interesting photographs and

(Continued on page 48A)

ANNOUNCING....

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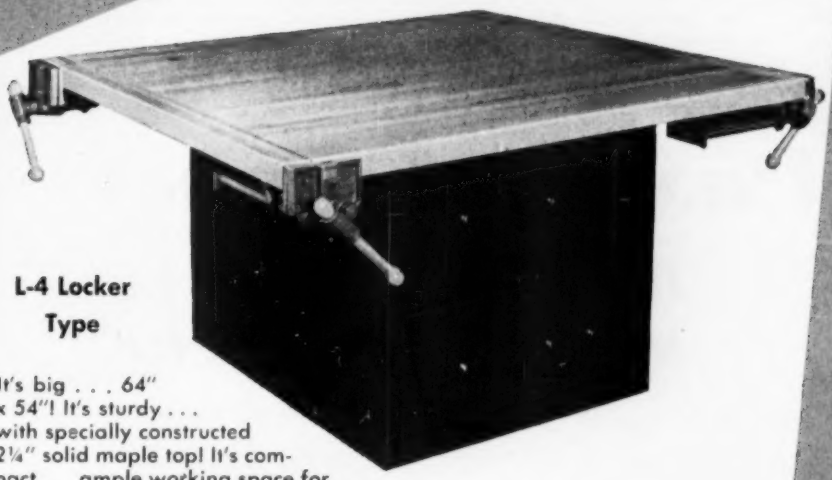
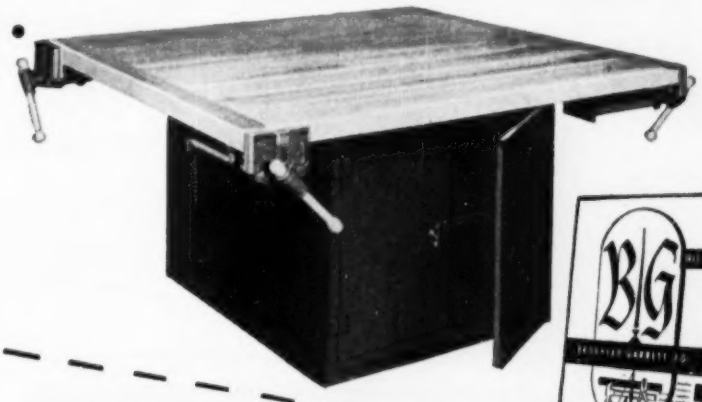


L-4 Locker Type

It's big . . . 64" x 54"! It's sturdy . . . with specially constructed 2¼" solid maple top! It's compact . . . ample working space for 4 students with each corner equipped with a strong 5CD Columbian vise! Vise ends of each bench are reinforced with 5" battens firmly bolted for solid foundation. Recessed base provides maximum work area with minimum floor space. Heavy gauge metal base, attractively finished in olive green enamel, contains 12 individual storage lockers, numbered and equipped for padlocks. An instantaneous hit wherever installed. Immediate delivery.



DD-4 Double Door

Same top construction, features and size as L-4 Locker Type with same recessed heavy gauge metal base attractively finished in olive green enamel. Only difference is that storage space below has a double door opening, with horizontal dividing shelf, thereby providing greater bulk storage area. A real investment in efficiency, economy and assured long service. Immediate delivery.

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"EVERYTHING IN INDUSTRIAL ART SUPPLIES"

EQUIPMENT LITERATURE

(Continued from page 46A)

articles on welding from all over North America, is now available.

Copies are mailed free of charge to anyone interested in arc welding. For your copy write the *Hobart Brothers Company, Troy, Ohio.*

(For Convenience Circle Index Code No. 0831)

HOME-MADE VENEER PRESS FRAMES

Adjustable Clamp Co. has published a valuable two-page instruction sheet on "How to Make Low-Cost Veneer Press Frames."

The material is well illustrated and the instructions for making the frames are clear and concise. If interested write for your free copy to *Adjustable Clamp Co., 424 No. Ashland Ave., Chicago 22, Ill.*

(For Convenience Circle Index Code No. 0832)

BUSINESS & PERSONAL NEWS

DISSTON'S NEW SAW PLANT AT MADISON, WIS.

Henry Disston and Sons, Inc., 113-year-old Philadelphia manufacturers of saws and tools, have broken ground for a new plant at Madison, Wis.

This plant will be devoted entirely to the manufacture of chain saws. It will occupy approximately 100,100 sq. ft. of ground and will be a one-story structure.

The firm also has taken over the plant formerly occupied by the General Mfg. Co., at Wisconsin Dells, Wis.

BLACK & DECKER EXPANDS

The Black & Decker Mfg. Co., world's largest portable electric tool manufacturer, will build a 126,800 sq. ft. addition to their Hampstead, Md., branch plant. This will more than double the present size of this plant.

Actual construction will begin within the next few weeks with the final completion scheduled for November. However, it is expected that the new addition will go into partial operation as early as September. The new addition will be all on one floor level.

The firm's original 110,000 sq. ft. Hampstead plant went into operation in April, 1952. Besides expanding the company's operations, it permitted the relief of congested conditions at the Towson plant and resulted in manufacturing efficiencies.

Besides its two Maryland operations, the company has a large plant making the same products at Harmondsworth, England. Black & Decker owns and operates 31 factory service branches in the U. S. and has wholly owned subsidiaries bearing the Black & Decker name in Canada, England, Australia, Mexico, and Brazil.

Alonzo G. Decker, Jr., is vice-president in charge of manufacturing and John L. Slade is Hampstead plant manager.

ARTHUR A. GUSTAFSON APPOINTED DISTRICT SALES REPRESENTATIVE

Arthur A. Gustafson has been appointed district sales representative of American Silver Company, Flushing, N. Y.

Mr. Gustafson will represent American Silver Company in the states of Minnesota and Iowa. His office will be located at 2580 University Ave., St. Paul 4, Minn.

HARRY C. SLAGLE HEADS TRAINING PROGRAM

Harry C. Slagle, manager of Aluminum Company of America's Chicago Works, has been transferred to Pittsburgh as manager of Alcoa's Shop Training Program.

He will be succeeded by Mr. R. E. Sheffer, staff assistant to the general manager of the Company's Fabricating Division.

NEW EAST COAST ROCKWELL REPRESENTATIVE

William E. MacLachlan, manager of the order department of the Hoboken, N. J., warehouse of Rockwell Manufacturing Company's Delta Power Tool Division, has been named special school sales representative for the East Coast.

Mr. MacLachlan will make his headquarters at the firm's New York City office in the Empire State Building. He will serve as technical adviser for the planning of school shops throughout the East.

NEW WEST COAST ROCKWELL REPRESENTATIVE

Fred Plonsky of Dallas, Tex., a district sales manager of Rockwell Manufacturing Company's Delta Power Tool Division, has been appointed West Coast special representative for school sales.

Mr. Plonsky will make his headquarters at San Francisco, Calif., and will serve as technical adviser for the planning of school shops throughout the West.

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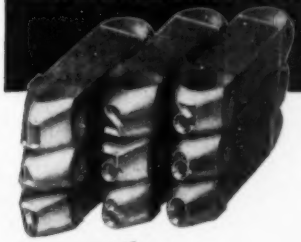

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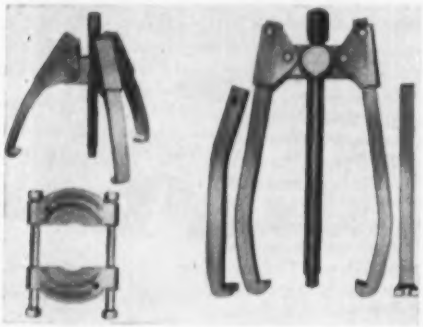
SHOP EQUIPMENT NEWS

WILLIAMS ANNOUNCES NEW LINE OF GEAR PULLERS

This new line contains a complete and versatile system of gear and wheel pullers available for proper maintenance of industrial equipment, automobiles, trucks, aircraft, farm and highway equipment.



New Line of Gear Pullers

Jaws and blocks are forged from selected steel and heat-treated for extra strength and safety. Jaw clips are self-adjusting. Forcing screws are made of high-quality alloy steel and heat-treated. New "unified" thread on screws and blocks is the latest development in screw thread design.

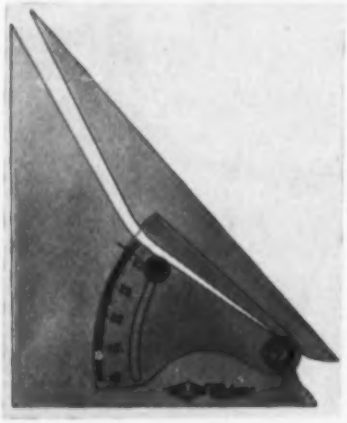
Two- and three-jaw styles in many sizes are available with changeable jaws to extend the range of their use and capacity. Several styles of "all-purpose" and slide-hammer pullers are equipped with many attachments making it possible to assemble just the right puller for the job. These and many other special types of pullers are completely illustrated and described in the new Williams Gear Puller Catalogue No. A-525.

For further information, write to *J. H. Williams & Co., 480 Vulcan St., Buffalo 7, N. Y.*

(For Convenience Circle Index Code 0801)

NEW ADJUSTABLE PROTRACTOR TRIANGLE

A new adjustable protractor triangle that permits the drawing of accurate angles from the base line has been introduced by The Alvin Company. It is a real aid to draftsmen, engineers, students, and others who require rapid angle measurements. The "Tru-Angle" can quickly be set to precise graduations of ½ deg., then firmly held in place with a knurled-knobbed screw. The graduations are die sunk and indicate angles from 0 to 45 deg., and from 45 to 90 deg. The triangle is made of crystal-clear optical Plexiglas, with all blind spots eliminated. It is a shatterproof, heat-resistant instrument that is impervious to wear, warp, and discoloration.



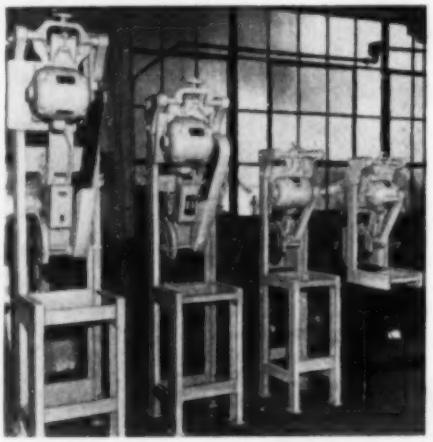
Adjustable Protractor Triangle

Alvin "Tru-Angles" are available in three sizes: 6, 8, and 10 in. Additional information may be obtained from *The Alvin Co., Windsor, Conn.*

(For Convenience Circle Index Code 0802)

HESTON & ANDERSON ADDS NEW MODEL

Heston & Anderson has added a new model to its line of swing cutoff saws and has redesigned its smallest model.



New Swing Cutoff Saws

Shown left to right in the illustration, are the following machines: The No. 55, with 16- or 18-in. blade; No. 25, with 14-in. blade; the new model No. 15, with 12-in. blade; and the redesigned No. 5, 10-in. bench model which is also available as a floor model.

Heston & Anderson's automatic air operating unit may be used with all models. The company regards this unit as the answer to maximum speed, and points out that in recent tests up to 77 strokes per minute were reached in cutting 6- to 12-in. core blocks.

For further information write to *Heston and Anderson, Fairfield, Iowa.*

(For Convenience Circle Index Code 0803)

LUFKIN "MITI-MITE" MAGNETIC BASE INDICATOR HOLDERS

The magnetic base indicator holders eliminate cumbersome haphazard clamping — speed up the job, and give greater accuracy. The indicator holder is placed against any round or flat iron or steel surface. The powerful permanent magnet holds them instantly. The swivel action post can be quickly and firmly secured in position with knurled lock nut. Sensitive friction joint gives accurate adjustments. The holders are ideal for use on lathes, shapers, mills, and planers.

No. 100 Magnetic Base Indicator Holder

Three models are available:

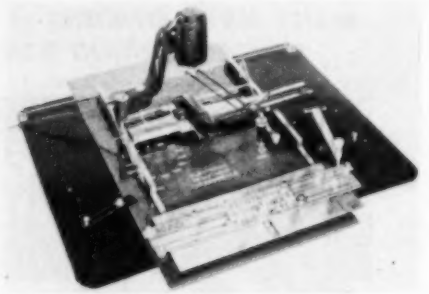
No. 100: permanent magnet provides 50-lb. pull; No. 101: same as No. 100, but with extra fine adjustment features; No. 150: the heavy-duty unit. Its permanent magnet provides 100-lb. pull.

For free descriptive literature write to *Lufkin Rule Co., Saginaw, Mich.*

(For Convenience Circle Index Code 0804)

THE NEW HERMES ENGRAVOGRAPH

A new technique for transferring repeated elements for drafting which remain constant from job to job has just been announced by New Hermes Engraving Machine Corporation.



New Hermes Engravograph

Architects and engineers who are constantly faced with the problem of reproducing standard elements such as switch assemblies, pump units, valves, etc., which must be duplicated for plans covering projects of similar nature, may now eliminate the costly and time-consuming process of redrawing each time an element which appears in an assembly. Instead, the draftsman utilizes the New Hermes Engravograph to cut precision templates of the units to be repeated.

With the Engravograph, the draftsman creates templates to suit his individual needs with speed and economy. A master design may be quickly prepared, from which the Engravograph reproduces the template by means of a rotating engraving cutter guided by a pantograph, duplicating the original on a sheet of transparent plastic. The engraving cutter can be shaped so that the image produced has beveled edges conforming to

(Continued on page 52A)

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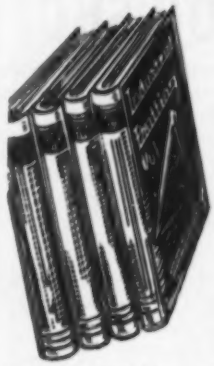

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SHOP EQUIPMENT NEWS

(Continued from page 50A)

the angle of the point of the pencil necessary to produce accurate lines.

For firms not wishing to cut their own master templates, New Hermes will furnish the templates from drawings or sketches submitted. Further information is available from *New Hermes Engraving Machine Corp., 13–19 University Place, New York City.*

(For Convenience Circle Index Code 0805)

FOUR-STUDENT WOODWORKING BENCH

The Industrial Bench and Equipment Mfg. Co., Inc., announces a new line of student workbenches and locker combinations.

These benches are 32 in. high and comprise 12 sturdy lockers of 20-gauge metal, finished in green enamel, each 12 by 15 by 21 in. A 5CD Columbian Vise is affixed to each of the four corners of the maple top.

Four-Student Woodworking Bench

The 2¼ by 54 by 64-in. top is of specially selected hard edge grain maple, kiln dried to not over 4 per cent moisture content at time of working. The laminated strips are joined true, glued, and reinforced with heavy bolts into one piece. The bolt holes are counterbored and plugged. The tops are sanded and finished with clear lacquer or shellac on face and edges and black wood sealer on bottom. The working surface is absolutely clear of bolts, nuts, holes, and sharp edges.

For further information, address *The Industrial Bench and Equipment Mfg. Co., Inc., 98 South St., New Britain, Conn.*

(For Convenience Circle Index Code 0806)

NEW STEEL TABLE CONVERTS PORTABLE ELECTRIC SAWS

A lightweight, 18 by 21-in. rigid steel table with an angle gauge and fence, which quickly converts a portable electric saw into a table saw, has just been placed on the market by Porter-Cable Machine Company.

It weighs only 42 lb., and can be transported easily to any work site. Legs can be temporarily disassembled if necessary for more compact portability. It is suitable for building contractors, carpenters, homecraftsmen, school shops, and farmers.

The table will accommodate any of seven Porter-Cable electric hand saws. The inverted saw is mounted to the underside of the table with the blade protruding through a slot. Depth and angle of cut are adjusted by controls already built into the saw itself. Two knurled knobs

(Continued on page 54A)

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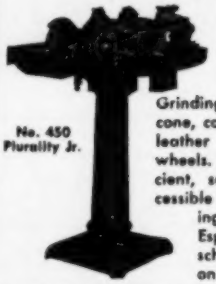

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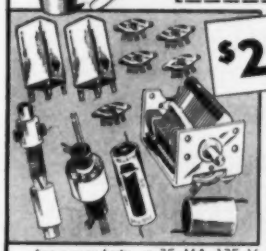

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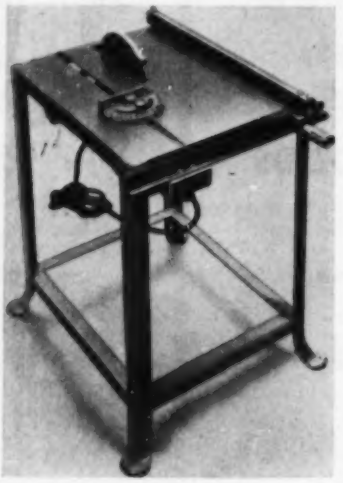
SHOP EQUIPMENT NEWS

(Continued from page 52A)

hold the rip fence absolutely square at any position along a steel guide track. A calibrated angle gauge rides in a slot parallel to the fence and



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(Continued on page 56A)

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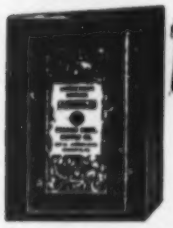

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SHOP EQUIPMENT NEWS

(Continued from page 54A)

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(Continued on page 37A)

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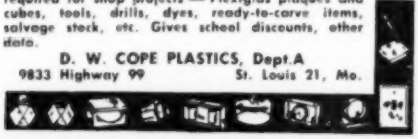

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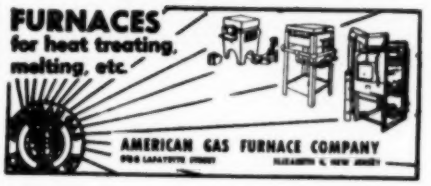

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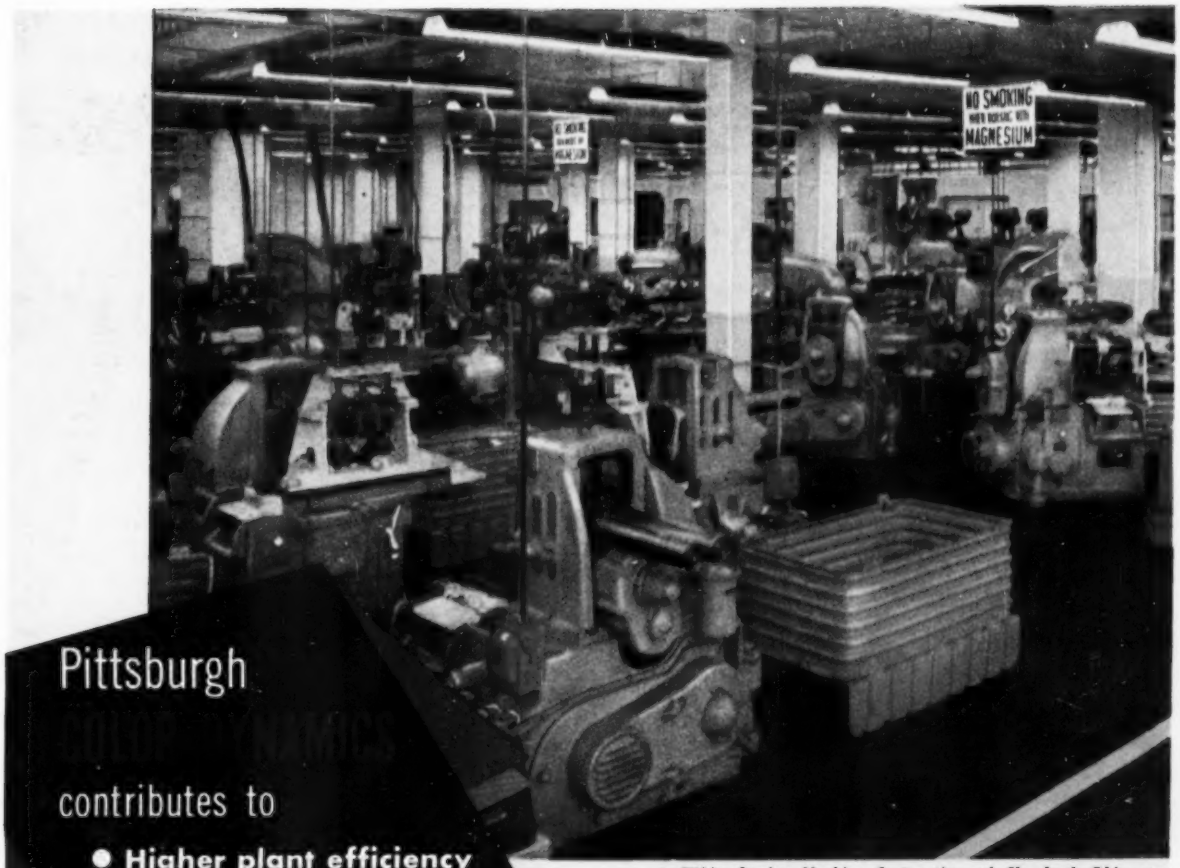

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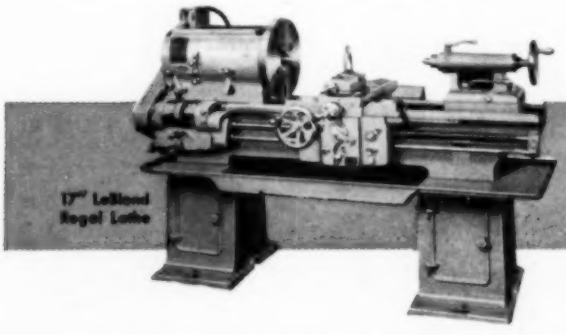

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